INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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Industrial-Arts Education

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A study of what teacher-training institutions offer to the student preparing to be an industrial-arts teacher, together with suggestions of what these offerings ought to consist.

Nearly a decade has elapsed since a composite inventory has been made of industrial-arts-teacher education. During this time the country has gone through a period of financial depression which has shaken the whole civil structure. It seems fitting, therefore, that inquiries and analyses which bring out the status of existing programs be undertaken in order that appropriate developments may be made which will be in keeping with general reconstruction over the country. It is with this thought that the study[1] from which the following abstract is taken attempts to show an overview or composite of industrial-arts-teacher education in the United States.

Industrial-Arts Education. Programs of teacher education in industrial arts on the undergraduate level are the result of the needs for teachers in the public schools in this phase of education. These needs have not only grown in the extent of numbers of teachers, but they have been constantly undergoing change purportedly to meet the needs of pupils as they prepare to participate in a changing social order.

Program Components. Back of any program in industrial arts that will stand the test of "What knowledge is of most worth?" must be principles and concepts deeply rooted in accepted philosophy. All other factors are set up according to these concepts and comprise the following elements: Physical setting, entrance requirements, curriculum requirements, institutional policies, personnel, extracurricular activities of students, professional meetings, teacher supply and demand, and miscellaneous controls of policy. The accompanying brief discussion of findings relative to these factors will be followed by their implications for an improved program.

Evolution of the Industrial-Arts Concept. The rapidity of change in concepts of what we now call *industrial arts* is seen in the 49 different terms used in various parts of the country to name this field of work in the schools and colleges. Some of these terms are made up of words dating back to the thirteenth century. The addition of new words to the language for naming processes and products of the ever-expanding industrial life was only natural, and favored terms were carried into the schoolroom to describe similar work undertaken there. Since this work was largely manipulative in the beginning, the word *manual,* because of its reference to the hand, became the key word to the most favored expressions until the launching of the term *industrial arts* by Frederick Gordon Bonser, of Columbia University, about 1912. While he had used the term some years earlier in connection with work he and Dean Russell were undertaking, his definition explaining its use was not published until he wrote in the *Elementary-School Curriculum:*

> Industrial arts as a school subject is the distilled experience of man in his resolution of natural materials to his needs for creative comfort to the end that he may richly live his spiritual life.

Later, in *Industrial Arts in the Elementary Schools,* he gave the definition this refinement:

> Industrial arts is a study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes.

The present study shows in considerable detail how the principle that "Education should consist of the reconstruction of experience into usable life patterns," as Dewey put it, has gradually come into general acceptance. The principle is shown to be no radical development of a single mind, but having its origin as early as the writings of Plato, it has come down in various terms through a long line of leaders who were champions of public-school education. The writings of such men as Luther, Comenius, Milton, Bacon, Petty, Rousseau, Pestalozzi, are but a few examples in the development which gives validity to the Dewey concept. The Bonser definition of industrial arts is shown to be not only in harmony with this concept, but may be just another way of wording it.

As public-school administrators and practical-arts leaders have come to recognize the connotation of the term *industrial arts* as conforming to the objectives of general education, they are using the term, not only in their writing and lectures, but to name departments as well. However, there are many public-school programs where the *manual-training* concept of skills and mental discipline, and numerous modifications, still persist as objectives. Vested interests, and lack of background in educational principles are largely responsible. All of the concepts and policies relative to public-school programs are reflected in teacher education. These will now be examined in their various elements.

Physical Setting. Sixteen per cent of the colleges have separate buildings for industrial arts. There is no uniformity of specifications, and the buildings are of various sizes and heights. They are constructed of numerous materials, though most are fireproof. Some colleges have buildings housing industrial arts and home economics, and some have engineering and industrial arts in the same buildings. One third of the colleges have their industrial-arts departments in the same building with general academic work. While the various buildings housing the departments in different schools are designated by numerous names, the name *industrial-arts building* leads in frequency of mention.

Industrial-arts departments are composed of laboratories for activities which are listed under 44 different heads, though subjects which are offered in more than 20 colleges (30 per cent) are as follows in the order of frequency:

Bench woodwork, architectural drawing, advanced turning and cabinetmaking, machine drawing, printing, sheet-metal work, machine shop, electricity, elementary cabinetwork, general metalwork, wood finishing, and general shop.

Equipment ranges in value from $2,000 to $100,000, and building costs from $6,500 to $200,000. The physical setting,

[1] Ashley, Lawrence Floyd. *Industrial Arts Education.* Columbus, Ohio. The Ohio State University, 1936, 176 pp.

buildings and equipment, affects teacher education in that graduates with strong majors come from the extensively housed and extensively equipped plants, while situations with less extensive settings send out graduates with more academic work and a weaker major.

Entrance Requirements. English, mathematics, science, history, and languages, seem to have traditionally preferred places in the list of units a high-school graduate must present to matriculate in most colleges. Other courses are usually lumped together as *vocational subjects*, and as a rule but little credit is allowed for this work, even if the student plans to continue with it as a major.

Only one of sixty colleges used the term *industrial arts* on its entrance blanks (1935). A few used the term *manual arts*, while several used the term *manual training*. The candidate for college work is usually required to be a graduate of an accredited or an affiliated high school offering a minimum of fifteen units of work (120 sixty-minute hours). However, age, teaching experience, teacher's licenses, and examinations are often considered as substitutes for high-school certificates. A letdown of requirements is seen in some schools which attempt to gain prestige through large enrollments, and deliberately induce students to enter. Various means are used from the extolling of pleasures of fraternity life to monetary awards.

Curriculum Requirements. Some so-called industrial-arts programs consist of purely technical courses with or without related information. These are found where engineering settings are used. Such situations pay little or no attention to public-school needs. The curricula of some colleges indicate that industrial arts and vocational work are synonymous, and requirements do not differ in either area. Some colleges have mixed courses where purely technical work is given in certain rooms, and courses with general-education objectives are given in adjoining rooms. Others have programs so planned that students may take one of several different industrial-arts majors. Because of these divergent conceptions of the problem of industrial-arts education, one is not surprised at the variety of course offerings he finds.

Course requirements fall into the following groups: Technical, academic, special professional, and general professional. Physical education should be added to these, and in some cases, music. Courses average four quarter hours in length.

Special professional courses are given in all schools under eleven different titles. Each school requires at least one, though the average number is three.

Courses in general education and psychology may be grouped as general professional requirements. They are listed by twelve titles. Each school requires an average of five.

Forty-four titles are used to describe offerings in technical courses. The mean number required is 12.5 or 50 quarter hours.

The total mean requirement in all areas is 110 quarter hours. The total technical and special professional requirements in industrial-arts education average 62 quarter hours. Subtracting 110 quarter hours from the total number required for the baccalaureate degree (192) leaves 82 quarter hours which may be used for minors and general electives. The range in requirements for majors and minors is considerable. This is also true of the range of total requirements for graduation. The latter is from 180 to 230 quarter hours, while the mean requirement for a major in industrial arts is 61.2 quarter hours. Twenty-five per cent of the colleges require a minimum of 80 quarter hours for the major, and seven of them require more than 100 quarter hours.

Besides specific requirements in industrial arts, additional course offerings are found in most colleges, which make it possible for a student to elect technical work to the extent of 18.5 quarter hours on the average. The range is from 2.5 to 48 quarter hours. It is seen from this that with the requirement of 61.2 quarter hours and the mean number which may be elected, a student may get an average of 79.7 quarter hours in industrial-arts subjects. This is true for 46 per cent of the colleges giving four years of undergraduate work in this area.

Various course offerings occur at different grade levels in different schools. An example is the course in tests and measurements. This course is found in one school in the freshman year, in three schools in the sophomore year, in ten schools in the junior year, and in twelve schools in the senior year, and it occurs in many schools as a graduate course.

Depression schedules (1930–1935) caused requirements to be lowered in the small colleges, in order to give an acceptable preparation in as many areas as possible so as to increase the opportunity of each prospective teacher for employment. The larger colleges have continued to hold to strong requirements in the major, and the requirement of but one minor. The range in required minors is from 0 to 4, with an average of 1.5.

Institutional Policies. Institutional policies, as referred to here, are those imposed upon the department by the executive committee of the school, or by the president. They may relate to any phase of departmental activity from the naming of courses to the use of laboratories and equipment. While considerable exploiting of students was seen in some programs, institutional policies were confined for the most part to expenditures for equipment and supplies, the charging of fees, with student and faculty personnel, with entrance requirements, with credit allowances, with extracurricular activities, and with general controls of policy.

The matter of credit allowance belongs to some extent with entrance requirements, but refers primarily to the policies of certain schools in granting credit for trade and teaching experience. Seven schools grant from 4 to 60 quarter hours for the former, and ten schools grant from 8 to 18 hours for the latter.

Faculty and Student Personnel. While there are no legal requirements governing the preparation of college faculties, accrediting agencies require certain standards for the college as a whole. Industrial-arts faculties have college or university training ranging from no degree to the degree of doctor of philosophy. A comparative study showed that there had been a decided advance in faculty attainment during the past ten years. Staff membership averages a little more than two persons giving full time to industrial arts, and a little over four giving some time to the field. Most of the teachers are men.

The student body is made up of both young men and women, some of whom elect courses; some are earning credits for a minor in industrial-arts education, and others are majors in the department. Most of the students are engaged in one or more extracurricular activities which they carry on along with their training.

Clubs and Fraternities. Because industrial-arts education necessitates a certain degree of scholarship for proficiency and certification, its program must be concerned with all of the activities of the student. Colleges now have many student organizations, including clubs and fraternities. Some of them are professional in character, and others are purely social. There are numerous other activities for certain students ranging from the firing of a furnace for one's living, to the responsibilities of a class presidency. The number of activities in which a student may engage is regulated in most schools both by limiting the number in which he may participate, and by a minimum scholarship requirement for participation. Some fraternities — Epsilon Pi Tau, for example — help students to a better professional understanding and increase their respect for their chosen field.

Other Determiners of Policy. There are certain major factors limiting the program of industrial-arts education in most colleges. An analysis shows that 74.6 per cent

make their course offerings conform to the state certificating laws, regardless of when they were made or how they apply to present concepts of education. The programs of 9.4 per cent are set up arbitrarily by the executive committee of the college without an industrial-arts representative, while 31 per cent make up their programs in a similar way but include an industrial-arts representative on the committee. Graduate-school entrance requirements are the concern of 13.6 per cent of those preparing undergraduate curriculums. Industrial-arts faculty members make out their own courses and and departmental requirements in 60 per cent of the cases. The above percentages are seen to be overlapping because one factor may apply in several instances.

State and national organizations affect policies through their annual programs, and through legislation which they may sponsor. Current educational literature, and surveys are also factors of influence. The growing tendency of administrators to study educational principles and psychological methods in planning programs carries with it changing concepts of content and method, which are reflected in industrial-arts offerings in the public schools, and hence, in the colleges.

Conclusions. Programs of teacher education in industrial arts differ greatly in various colleges over the country. These differences are seen in every factor making up the program, and the range of difference is very marked in some of them. Perhaps the major element in a teacher-education program is the curriculum requirement. The wide range for the baccalaureate degree has been noted. However, the major field of preparation is of greatest concern in this connection. When one notes a range of from 36 quarter hours (the requirement in some schools) to 146 (the requirement in one school), it becomes apparent that the interpretation of the problem of industrial-arts education varies greatly. This is seen in the variety of names given to the departments; in the titles of the directors or professors; and in the teaching emphasis, whether purely vocational, or generally cultural.

Other factors in which colleges vary are: (1) Entrance requirements, (2) physical setting, (3) number of minors required, (4) academic requirements, (5) age levels for various courses, (6) number of instructors, and their preparation, (7) institutional policies, and (8) auxiliary factors in the program, such as clubs, fraternities, other student activities, and professional meetings. There is considerable variation in the supply of and demand for teachers which the programs need to recognize in their course offerings. It is shown, however, that colleges are partly responsible for existing programs because of their efforts to supply teachers for them.

Implications for an Improved Program. Since the study is concerned with programs in industrial-arts education, which have for their major objective the preparation of teachers for public schools, all policies of teacher education must contribute to this objective. However, the objectives of industrial arts are not interpreted similarly either by public schools or by colleges. Consequently, various demands are made on teacher-education programs. Difficult and unusual programs continue to appear in the public schools and will continue to do so as long as the colleges make efforts to prepare someone to undertake them. These efforts must continue until such time as proper changes can be made in certificating laws and other determiners of policy previously mentioned, and new requirements resting upon basic educational objectives be substituted.

Educational concepts subscribed to by experts in public-school education demand a program in the public schools in line with the Dewey philosophy that "Education should be a reconstruction of experiences into usable life patterns." This indicates that industrial arts in the public schools should cut across those life patterns which may be applicable at various age levels. These patterns are seen to involve avocational interests, consumer knowledge and appreciations, personal-social developments, desirable-trait development, common technical knowledge, vocational connections, and professional objectives.[2] Such a program is found in the general-shop situations which are springing up over the country, where activities in major industrial areas are represented, and where these activities are operating simultaneously in one large room. Vocational connections are attained through longer participation in any one area, or by attending a unit shop where all of the time is devoted to one area of work, such as printing.

General acceptance of the idea that boys and girls should have an opportunity to explore in major industrial activities, is demanding a teacher with training in several areas other than the traditional woods and drawing. A difference in the kind of training is also seen as the psychological approach to learning (the student-interest basis) becomes more in demand.

This suggests that colleges which endeavor to prepare teachers adequately for industrial-arts positions must build into their programs certain necessary offerings. These should include what different public schools now offer in unit shops and courses of equal educational validity, such as: woods, metals, graphic arts (printing and drawing), auto mechanics, electrical work, ceramics, and textiles. College freshmen should begin with an orientation course, such as general shop, in which all of these areas are found. Such a course will not only acquaint them with industrial-arts activities that will enable them to decide the advisability of continuing in this field of work, but will give them a chance to participate in a situation like that which they will later have to master as teachers. The orientation course might well last a semester, or even a year. During the sophomore, junior, and senior years, additional specialization should be possible in each area to the extent of a minimum of 10 or 12 quarter hours. The technical courses should be supplemented with special professional courses. Three courses, or 12 quarter hours, the average now offered, is suggested for a minimum requirement. These courses should include special methods pertaining to all areas of technical work; a course in the development of industrial-arts philosophy which will show the need for and the contribution of industrial arts in general education at different age levels; and possibly a special-problems course to make clear matters of organization and administration. These courses should come in the junior and senior years when they will possess most meaning. The senior year should also contain the requirement of three terms of practice teaching in different areas, one of which should include general shop.

There will need to be a minimum requirement of 80 quarter hours in technical and special professional courses for those who plan to teach in a general shop. If more can be attained, so much the better.

General professional courses including courses in education and psychology now average five in the total number required in different colleges. This is suggested as an adequate minimum requirement in this area.

The rest of the curriculum will be filled with a few courses in expressional English, history, economics, and science to make a well-rounded program and to contribute to the effectiveness of the industrial-arts offerings. There should still be a sufficient difference between the 192 quarter hours for graduation and the total course requirements for one or two minors of about 27 quarter hours each.

If the suggested program for teacher education is carried out, there will need to be considerable revision in many curriculums. Attention will need to be given to researches on laboratory planning, equipping, and housing to improve the physical setting, and the securing of an adequately qualified staff.

[2] See: William E. Warner. "Industrial Arts Research." INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, 24:2. 1935, p. 40.

Photography Offers A Challenge

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A new subject which may well be added to the shop curriculum on either the industrial arts or the vocational level.

For some time there has been a need for teaching of the elementary principles of photography in the public school. Nearly every modern home now possesses a camera of some sort; millions of dollars worth of films and sensitized paper ($60,465,356 for 1931)[1] are consumed by the American public each year; newspapers and magazines are copiously illustrated with the results of the photographer's art; and the movies annually collect staggering sums of money ($406,542,000 for 1933)[2] for their productions. Moreover, the giant of photography is growing rapidly (six-fold in 27 years)[1] and bids fair to become of first rank as an industry of magnitude and importance. Surely you and I and Young America should study the art and science of photography.

Photography is of value because it can be correlated with so many of the subjects already in the school. In artwork, beautiful scenes of objects of art can be photographed and used either in print or lantern slide form. Now that lantern slides in natural color can be made by photographic processes, there is even greater inducement for the use of photography by the art teacher.

Not only is photography of great use to the art teacher, but it bears close kinship to chemistry and physics. The various chemical operations and physical laws which are made use of in photography are tremendously interesting when they are utilized to some purpose which is vital in the life of the boy or girl.

In nature study, photography is of great value. Specimens of various kinds may be photographed in their natural habitat. The dead, dried, discolored specimens in a herbarium compare not at all with the photographs of the objects as they are found in nature. Color photography has a place because the colors of the object can be shown in the lantern slide or in the form of a transparency. Color movies are now available for amateurs and will, doubtlessly, be used extensively in the future for nature study and travel purposes.

[1]Biennial Census of Manufactures for 1931, Bureau of Census, United States Department of Commerce, Washington, D. C.

[2]Almanac and Year Book for 1936, Chicago Daily News, Inc., Chicago, Ill.

In home-economics education, photography also finds a place. House decoration, home planning, landscape design, table manners, and costume design are but illustrations of the subjects in which photography can be used to extremely good advantage.

In athletics the camera has long ago found its place. What could be more interesting than real photographs or movies taken by the class in photography of the team in action! Some may have thought that these are jobs for the professional photographer. This may have been true several years ago, but is no longer the case. Equipment has been so simplified and processes so standardized that the amateur can produce results which often cannot be distinguished from those of the expert.

Fig. 1. Girls should have photography as well as boys

In other industrial-arts subjects, photography also is of great value. In printing, for instance, photography of various school events may be taken by the class in photography and can be used for the making of illustrations for the school newspaper, the high-school annual or publications of similar nature. The various projects in industrial-arts classes may be photographed and used for instructional purposes in succeeding classes. Also, the other laboratory classes offer excellent opportunity for the making of apparatus which can be used by the class in photography.

While photography is useful in the school, it also can serve equally well in the home. Cameras are now available at almost any price and there is scarcely a home so restricted in means that occasional picture-taking is not indulged in. However, there has been much money ill spent. Cameras, photographic equipment and supplies in general are not purchased intelligently. The company which does the most advertising sells the most goods regardless of quality of suitability. All this must change, and the only available medium to bring about desirable changes is education. Cameras, lenses, films, and so on, should be purchased with certain ends in view. The American public should learn that there is no all-purpose camera, lens, film, or anything else.

Then, too, the average home member, after he has made a wise choice of camera and supplies, should learn how to use these intelligently. Most folks think that all that needs to be done in taking a picture is to snap the shutter and that somehow the photo finisher is to blame if the roll of film does not result in perfect pictures. Double exposures, under-exposures, over-exposures, movement of the camera, improper diaphragm opening, movement of the subject, poor choice of background, not holding the camera level, and so on, are responsible for more than 80 per cent of the failures in amateur photography. However, when one considers the lack of education in photographic principles, it is a genuine miracle that even the small percentage of pictures do turn out good. Film speeds mean nothing to an average individual; diaphragm openings are a mystery; composition is an abstract term; light intensities are only two, that is, sunlight and shade; shutter speeds are useless, at least they are left off most cameras (box cameras are by far most numerous); light filters are made for looks; tripods are unnecessary contraptions; and so on — to the average user of a camera. This profound, although entirely excusable, ignorance should be replaced by intelligence, and the proper place to impart that intelligence is in the public school.

Furthermore, photography will be of value because everyone in a social-industrial society should be able to develop ordinary films and make ordinary prints. At this point there is certain to be a loud protest from some who fear that the work

of the commercial finisher will be thus jeopardized. Such fear is groundless. The more success anyone has in taking pictures the more pictures will he take. And success is based on an adequate understanding of the principles of photography. The best way for establishing this understanding, is to give the individual competent instruction, and assist him to go through the common processes. Such a person may not become an expert finisher, but he will come to understand more fully what takes place from the time the film is loaded until the print is finished. Because of this understanding, he will take more and better pictures and while a few will continue to do their own amateur finishing, the great majority will probably always send their work to experts for developing and finishing, yet the knowledge gained at school about photographic processes will make them more intelligent consumers of expert services.

In addition to being able to perform the processes of developing and finishing, Mr. Average Citizen should know the uses to which the more complex photographic processes can be put. Many of these are too difficult or complicated for any but the expert, yet the average person should know of their possibilities. The processing of amateur movie films, photomicrography, color films, dodging, lantern slides, reversal processes, retouching processes, X-ray photographs, the making of enlargements, and the use of infrared films are but instances. Through readings, demonstrations, and group experimentation enough will be learned about these and other specialized phases of photography so that the ordinary person can at least ask intelligent questions of commercial photographers.

A valuable outcome of a course in photography and one which may be as truly a part of a first-rate course in printing is an understanding of the common ways in which photography is utilized in the printing industry. The necessary qualities of a print or drawing for reproduction, the kinds of work to which zinc-line cuts and halftones are suited, processes of color reproduction, and photo-engraving are all more or less mysterious to the average person. When one considers the increasing extent to which these processes are used every day, he is amazed that the schools have persisted so long with formalized training and antiquated ways. These new understandings and experiences should form a part of every secondary-school curriculum.

Yet another desirable outcome of a course in photography is the better understanding and opportunity to apply the various art principles which he has learned elsewhere in school. Very largely, the characteristics of a good painting, a good mural, a fine piece of tapestry, a drawing or an etching are also the characteristics of a good photograph. To be certain, these characteristics are obtained with new media and by new methods, but the art principles remain very largely the same. And it is well that this is so. The pupil in the public school needs much opportunity to apply fundamental principles in varied and interesting ways and through varied media; thus will there be greater possibility that the principles will be permanently retained.

Fig. 2. Historic pictures always are interesting and instructive

One of the values of photography of increasing importance is the likelihood, especially for those who go into the various professions and related occupations, that the techniques and knowledges will find a future use in scientific or professional study. The engineer, the surgeon, the naturalist, the teacher, the journalist, the dentist, the lecturer, the aerial surveyor, the criminologist, the research worker, the author, the commercial artist, the metallurgist, the explorer, the press photographer, and many others are finding increased and extended professional uses for photography. To be sure, the techniques are specialized and the skill is greater in degree, but the fundamental principles remain very largely the same. The logical place to teach these fundamentals is in the public school.

Of increasing importance as an argument for teaching any kind of amateur art or craft, and especially photography, is the argument that it may be taken up as an avocation or hobby. City after city now has its organized group of amateur photographers. Regular meetings and lectures are scheduled; annual competitions are held and prizes are awarded. The interest in photography as an amateur hobby is rising. And this interest has developed under tremendous handicaps. Professional photographers, as a rule, have been unwilling to come to the assistance of the amateur. What has been learned has been acquired very largely by trial and error. Sooner or later, all this must give way to a program of education. Photography makes an ideal hobby. There is a never-ending array of possible equipment and materials, interesting processes, and novel applications. Photography is as interesting to the youth as it is to the old man; to the girl as it is to the boy; to the artist as it is to the technician; to the professional man as it is to the worker in the more humble occupations.

Photography is an excellent means of teaching a pupil to be careful, clean, precise, and methodical in his work. (This statement is made recognizing fully that the formal discipline theory has long been held in disrepute.) Since the interest factor of the average pupil in photography is so great, these values can be attained when pupils see the reasons for such care of precision. Five grains too much of potassium bromide in a developer may spoil the developer; one tenth of a second too much exposure may spoil the negative; prints not fixed long enough will show up later on; finger marks and careless handling of hypo will leave telltale marks on the finished work; carelessness in focusing on the ground glass will leave its indelible story on the developed film or paper; and so on. In photography, there are many variables and each must be taken into account else the desired objective will not be reached. The teacher, by pointing out the need for care and precision, and by developing in the boy a feeling of need for these desired qualities, not only in photography but in all phases of life, can render a tremendously worth-while service.

Such study of photography will make a

person more intelligent regarding an industry which is rapidly increasing in importance among American industries. The value[3] of photographic apparatus, materials, and projection apparatus produced by American manufacturers increased from $13,023,297 in 1904 to $79,506,499 in 1931. During the same period the value of lumber and timber products decreased from $579,777,310 in 1904 to $443,628,821 in 1931. The writers were unable to find figures which portray the evident increase in the number of persons who are largely dependent for a living upon the camera and its products. It is common knowledge, however, that there has been a tremendous increase in the number of workers in the motion-picture industry, in press photography, in aerial photography, in X-ray photography, in miniature photography, scientific photography, wire photography, photography for advertising, astronomical photography, color photography, and in many other branches. Many of these have developed very largely during the past 25 years so that there is little question that an increase has taken place. The average citizen needs to be intelligent regarding the large and growing industries. This must be the case in a democracy where the ballot box is available to all. Through organized study and experimentation the coming generation can come to know more of the industrial and social forces and issues which affect their daily lives.

Last, but yet first, photography offers an excellent opportunity for inculcation of high ideals and proper attitudes. No single department of the public school claims these as its especial province, yet unless they are emphasized whenever opportunities permit, our public education will be lacking. No doubt the person who said that "Education consists of what is left after one forgets what he has learned," had ideals and attitudes in mind. Very largely these are the "wheat" of education, while all the memorized formulas, facts, techniques, and skills are but the "chaff," so far as general education is concerned. And what an opportunity photography presents for developing high ideals and proper attitudes. The best picture hasn't been taken; the perfect lens hasn't been made; the plans for the finest camera still await the draftsman's pencil. There is little doubt that the developments of the past quarter of a century are inconsequential to what the next 25 years will bring forth. A first-rate course in photography under a competent and enthusiastic instructor will give the boy numerous challenges for the development of high ideals and proper attitudes.

At this point, the average industrial-arts teacher may say, "Yes, I surely agree that pupils ought to have such a course in photography, and furthermore, I would like to teach such a course, but I know very little about the subject myself. How and where am I to learn so that I may be able to teach the course?" Such questions are justified. To the authors' best knowledge there are but three teacher-training institutions in the country which include photography in their industrial-arts curricula. There are probably two or three more, but there should be threescore more. The best answer is for the industrial-arts teacher to be his own teacher. Secure and read several books on amateur photography; from photographic magazines secure the names of several photographic supply houses and send for their catalogs; secure some essential equipment on the advice of authorities; experiment and read concurrently; get in touch with other hobby photographers; study photographs of others; in other words, experiment intelligently and success is almost certain. This may cost from 50 to 500, but the professional investment will be worth while. One year of experience by one of the writers on the editorial staff of one of our professional magazines convinced him that the average person who submits material for publication does not know how to use a camera. This should be changed, and it can be changed either through self-education or by formal education.

Again the industrial-arts teacher is likely to say, "Well, suppose that I do take up photography, what shall the pupils and I attempt to learn? The field is so extended that it will take until doomsday to learn all about photography." Again, this is a good point. The writers would be last to urge a standardized list of "knowing and doing" items for photography. There is much danger in formalization whether it me in Latin or in industrial-arts education. The following is not presented as a course of study but is a summary of an attempt to determine topics which are most frequently mentioned in 20 books on amateur photography.

I. Introduction (14)[4]
   1. Discovery of the camera (6)
   2. Theory of action of light on film emulsion (2)
   3. First use of the lens (4)
   4. First photograph made (3)
   5. First prints made from negatives (3)
   6. First Eastman kodak (2)

Fig. 3. Everybody wants to be able to take good pictures

   7. First use of silver nitrate (3)
   8. Modern roll film (2)

II. Cameras (15)
   1. Pinhole cameras (4)
   2. Box cameras (10)
   3. Folding cameras (8)
   4. Professional cameras (3)
   5. Choice of cameras (4)
   6. Focusing of cameras by use of the scale (8)
   7. Focusing the camera with a ground glass (6)
   8. How to load the camera (3)
   9. Components of the camera (8)

III. Lenses (17)
   1. How the image is formed (7)
   2. Meniscus lens (box cameras) (6)
   3. Rectilinear lens (7)
   4. Focal length of lens (9)
   5. Theory of lenses (3)
   6. Lens aberration (11)
   7. Components of a lens (6)
   8. Angle of view of a lens (5)
   9. Speed of a lens (6)
   10. Selection of a lens (1)
   11. Achromatic lenses (5)
   12. Depth of focus of lens (6)
   13. Lens openings (5)

IV. Shutters and Diaphragms (10)
   1. Stops and diaphragms used (8)
   2. Depth of focus obtained (6)
   3. Different stop systems being used (6)
   4. Focal aperture of a lens (3)
   5. Examples of different kinds of shutters (10)
   6. Shutter testing (2)
   7. Speed of shutters (5)

[3] Biennial Census of Manufactures for 1931. Bureau of Census, United States Department of Commerce. Washington, D. C.

[4] The numbers shown in the parentheses after each topic indicate the number of times the topic was mentioned in 20 books on amateur photography. Thus, the general topic "Introduction" was mentioned in 14 of the 20 books.

V. Exposure (16)
1. Outdoor exposures (6)
2. Interior exposures (6)
3. Steps to observe in exposure (3)
4. Snapshot exposures (5)
5. Use of exposure meters (6)
6. Plate limits of exposure (3)
7. Slow-speed exposures (4)
8. Exposure for different kinds of film (6)
9. Theory of exposure (5)
10. Exposure of enlarging work (1)

VI. Darkrooms (6)
1. Equipment for darkrooms (11)
2. Essentials of a darkroom (3)
3. Darkroom development (2)
4. Design of darkrooms (2)
5. Finishing-room equipment (1)

VII. Development and Fixing (17)
1. Theory of development (8)
2. Plate development (6)
3. Film development (5)
4. Conditions affecting development (6)
5. Contrast obtained by development (5)
6. Daylight method of tank development (3)
7. Time control of development and its effect (5)
8. Formulas for developing (5)
9. Theory of fixation (8)
10. Formulas for fixing solutions (4)
11. Washing and drying of film (4)
12. Restrainers and accelerators used in development (3)

VIII. Printing (12)
1. Contact printing
a) By sunlight (4)
b) By artificial light (10)
2. Contrast in printing papers (4)
3. Use of different grades of paper (8)
4. Machine printing (3)
5. Making glossy prints (6)
6. Print embossing (2)
7. Theory of printing (5)
8. Fixing, washing, and drying of prints (5)
9. Mounting and trimming of prints (4)
10. Making individual printing parts (3)

IX. Defects in Negatives and Prints (8)
1. Results of underexposure (3)
2. Results of overexposure (3)
3. Results of overdevelopment (3)
4. Results of underdevelopment (3)
5. Defects due to improperly mixed solutions (3)
6. Defects due to improper focusing (3)
7. Defects due to tilting the camera (3)
8. Defects as the result of the wrong contrast (2)
9. Defects due to improper handling of the film (5)
10. Chemical defects (6)
11. Mechanical defects (2)

X. Enlarging and Copying (14)
1. Theory of enlarging (6)
2. Process of enlarging (7)
3. Enlarging with automatic equipment (3)
4. Kinds of enlarging papers (4)
5. Enlarging with the ordinary camera (4)
6. Equipment needed for enlarging (3)
7. Coloring enlargements (4)
8. Hints on enlarging (6)
9. Enlarging tables (3)
10. Copying with the ordinary camera (4)
11. Copying with a special camera (2)
12. Use of filters in copying old writings (4)
13. Copying tables of exposure (4)

XI. Portraits (11)
1. Portraits with the professional camera (3)
2. Portraits with the small camera (2)
3. Outdoor portraits (4)
4. Selection of lenses for portrait work (4)
5. Kinds of paper to use for portraits (8)
6. Kinds of film to use for portrait work (3)
7. Retouching negatives for portraits (2)
8. Balance and perspective in portraits (4)
9. Contrast in printing of portraits (3)
10. Development and fixing of portraits (2)

XII. Lantern Slides (10)
1. How to make contact slides (2)
2. How to make color slides (1)
3. Enlarging of slides (4)
4. Theory of transparencies (2)
5. Developer of formulas for lantern slide work (1)
6. Exposure for lantern slides (2)
7. How to copy slides (1)

XIII. Flashlight Pictures (6)
1. Flashlight exposures (3)
2. Taking indoor pictures with flashlights (4)
3. How to make silhouettes (6)
4. How to take flashlights of animals (2)
5. Equipment needed for flashlight work (1)
6. How to get composition in pictures (1)

XIV. Color Photography (9)
1. Theory of color sensitivity (2)
2. Use of filters in color photography (2)
3. Use of color screens for distance work (3)
4. Films used in color photography (5)
5. One-plate color process (1)
6. Three-plate color process (3)
7. Use of filters in taking pictures of clouds (5)
8. Toning of pictures
a) With a weak developer (10)
b) By redevelopment (2)
c) With special developers (1)
d) With special papers (3)
e) Sepia tones (4)

XV. Practical Work in Photography (5)
1. Plates and film used for motion picture work (1)
2. Theory of motion pictures (2)
3. Principles of airplane photography (4)
4. Survey photography (2)
5. Photomicrography (5)
6. Engraving (through visits to plants) (3)
7. X-ray photography (visits) (3)
8. Vignetting of prints (2)

XVI. Reduction and Intensification (9)
1. Theory of reduction (6)
2. Use of Farmer's reducer (4)
3. Reduction to destroy an image (4)
4. Reduction to destroy fog (1)
5. Theory of intensification (6)
6. Permanence of intensification (1)

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The Language of Furniture

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A plea for instilling idealism into the program of the school shop.

Educators have said that fundamentally our educational program is "To teach people to do better those things which they will do anyway." This is, indeed, a comprehensive statement. It includes everything from behavior attitudes to the development of latent abilities. Teachers of industrial arts and vocational education, if they be alert and progressive, must realize that their work is only a contribution toward the development of citizenship ideals, and must of necessity be of a purposeful and functional nature, if it is to be understood and assimilated. This necessitates that they must study the entire program of education to determine those values in their work which are most significant. In the primary years where the foundation of this type of work is laid, the work is of an exceedingly simple nature, such as working and building with blocks, coloring with

crayons, daubing with paint. This is for the purpose of developing proportion and color relationships. As this program of work progresses, different mediums are introduced, such as clay, soap, and the like, for modeling forms, and then cut-work, colored-paper work and things of this nature, to develop a recognition of the relationships existing in patterns, design, and shapes. Considerable time during the early school years is given over to this type of work which, in times past was considered art-work given with the hope that the talented and interested would profit by it. Now the realization is growing that it is a fundamental and necessary part of education for all, if people are to be taught to do better those things which they will do anyway.

Somewhere in the program, usually in the seventh and eighth grades, a new medium, "wood," is introduced and the work is called "industrial arts," although it does not differ materially from that taught in the earlier years. Years ago, the industrial-arts work was considered to be an introduction to the industrial fields. This is no longer in accordance with the modern philosophy of education. Industrial arts are now given which have to do with immediate learning and growth, and the teaching in this field should center around those materials which play an important part in the life of the individual. Wood, for instance, opens up the fields of interest. One of these is the making of furniture, but furniture must not be looked upon as merely something to be made, but as something to be understood. Furniture expresses the progress of man from history's beginning up to the present time. If man is to understand furniture, he must know something of the language of furniture. The design of the present-day furniture is not a thing of mere chance, but one of growth. The making of furniture is an art. It represents one of the oldest branches of man's handiwork. The furniture of any particular historical period, directly reflects the economic and social conditions of the time. As time passed, the march of progress was indelibly written into this story of furniture, and the evolution of our American civilization may be traced by studying the pieces of furniture which have been handed down to us. The design and craftsmanship of our early furniture is symbolic of the crudeness and simplicity of the lives of our forefathers. As new influences and factors crept into American life, so, too, did the structure of furniture change. Man is now living in an age of scientific wonders. Is it any wonder that a new form of design is reflecting present-day conditions?

The question naturally arises as to the value of this language of furniture in the field of woodworking. If the school is to teach the young how to live; instructors must strive to teach those things which make for happier living. The student must be led to understand and appreciate those things with which he is surrounded and which he can utilize so he may live more abundantly. The small furniture projects made in the school shop should only be a means toward this end. In so doing, we are not taking away, but rather adding to that which everyone should know how to do. This does not mean a change of methods in the shop, but an addition of ideals, which will broaden the vision of the teacher so that his enthusiasm for the beautiful in design may be radiated to his pupils. If the teacher enriches his work to the point where the students take away with them more than just what they made, he will have made an invaluable contribution to the educational program.

Information and Mechanical Aptitude

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This study, although not conclusive, is interesting, and shows what the school-shop instructor can do in the way of research.

Students taking industrial-arts courses frequently possess very little information concerning the nature of things. Some of them seem to be unable to plan and solve the mechanical problems arising in the shop, while others show a remarkable understanding and capacity for this kind of work.

One feels that the student who knows a great deal about the shop has received considerable training. This, however, is not always the case, for some of these students are by nature technically inclined and, therefore, have interests that help them attain this ability and general knowledge.

The investigation reported here was made to determine what relationship, if any, exists between shop information and mechanical aptitude.

There were two experimental factors involved in this study. The first one was shop information which means the accurate knowledge of the technical things which one meets in the school shop. The second factor was mechanical aptitude which means the acquisition of traits or skill to perform the fundamental operations of a mechanical nature.

In order to ascertain this relationship, 200 ninth-grade technical students in attendance at the Von Steuben Junior High School, Chicago, Ill., were chosen for the study. This group consisted of 100 ninth-grade first-semester boys and 100 ninth-grade second-semester boys.

In this study, then, the things considered were (*a*) shop information, that is, such content material as may be tested objectively on paper, and (*b*) ability to execute the fundamental operations involved in the woodworking shop.

The data were obtained through administering the Nash-Van Duzee Industrial-Arts Tests in Woodwork (*2*)* which were selected for the study because they are based upon representative courses of study, woodworking textbooks of wide adoption, material and state surveys, special references, and books on trade analysis. Under the three general headings of *skill, related information, and standards of attainment*, the content of the above sources was tabulated and graded. The test was then subjected to an extensive tryout, and refinements were made on the basis of this tryout.

The Stenquist Mechanical Aptitude Tests were also administered. These tests were selected because they have been found to be effective in detecting general mechanical aptitude. They call for an understanding in dealing with the nature and operation of machines and parts.

One day elapsed between the administration of the Nash-Van Duzee tests and the Stenquist Mechanical Aptitude Tests.

The majority of the students in this investigation have had the following approximate technical training:

Printing, 20 weeks.
Sheet metal, 20 weeks.
Woodwork, 9A students, 50 weeks.
Woodwork, 9B students, 40 weeks.
Electrical Work, 20 weeks.
Mechanical Drawing, 9A students, 80 weeks.
Mechanical Drawing, 9B students, 60 weeks.

There are many criticisms advanced regarding tests and their value for comparative purposes. However, specialists in the

*The number refers to a similar number in the bibliography at the end of this article.

testing field seem to agree that such a use of tests is justifiable. (3)

"One of the results of the testing which is now being done in the elementary schools is that a teacher may compare his class and the work of its individual members with like pupils in like classes in other places. Tests may furnish the only reliable means by which this can be done." (4)

The correlation between the results obtained from proper examination and those obtained from the performance type of examination has been found to be very high.

Stenquist asks, "May a child not be expert with his fingers and be able to score high in working with actual materials and still have but little knowledge of the kind called for in the picture tests?" (5)

It has been found in this investigation that the shop information and mechanical-aptitude tests are not administered conjunctively, and also that the aim is not to find the relationship between shop information, and aptitude. It seems that this relationship factor or problem has been overlooked.

The data in this study indicate that students who ranked high in the shop in information tests showed a tendency to rank low on the mechanical-aptitude tests. Those students who ranked high on the mechanical-aptitude tests were low on the shop information. A few exceptional students attained a high rank in both tests.

Since the 9B scores showed a negative correlation of .42 ± .05 and the 9A scores showed a positive low correlation of .35 ± .05, a conclusion may be drawn, that the 9A group, being a half year in advance and older than the 9B boys, have had more experience and training than the 9B group and, therefore, were better adapted to the measurement in the tests.

The negative correlation of the 9B's and the low positive correlation of the 9A's reveal the fact that there is very little or no relationship between shop information and mechanical aptitude.

The data obtained also indicate that some students are by nature technically inclined and through their interest attain a general knowledge about the shop, yet because of slow adaptability these same students are very poor in shop performance.

It is evident that the foregoing statement has some bearing on the reasons why students attained high scores in the shop-information tests and low scores in the mechanical-aptitude tests, or vice versa.

With the consideration that a further study in a technical senior high school might be desirable before considering this study final for technical pupils in general, it has been concluded from the data that shop performance may be taught to the student who has very little or no previous shop information; also that shop performance may be stressed in the teaching of industrial arts.

It is hoped that this investigation may prove of service to instructors in the industrial arts, and to others who may be interested to determine, when and where to stress shop information or mechanical aptitude.

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Effect of Doubling Class Periods

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A study made by an instructor of printing under ordinary shop conditions to show that the short shop period is not for the best interests of the student.

During the school years 1932–33, 1933–34, and the first semester of 1934–35, the parochial-school setup for class attendance in industrial arts for boys at the Arsenal Junior High School, Pittsburgh, Pa., was one 40-minute class period a week. These classes consisted of the seventh and eighth grades of the following parochial schools: St. Augustine, St. John, St. Kieran, St. Mary, St. Patrick, and Holy Family. The seventh-grade classes were given woodwork, electricity, and mechanical drawing. The eighth grades were given metalwork, printing, and mechanical drawing.

The shop teachers were unanimous in voicing the opinion that the one-period plan of scheduling was unsatisfactory. They did not believe that 40 minutes a week in these subjects was sufficient time to get them across to the pupils. They believed that if the time were doubled (making an 80-minute period), the pupils could more than double the amount of work done. First, they knew that the starting time and clean-up time could be decreased by one half. At least 10 minutes could be saved (five minutes for starting time, and five minutes for clean-up time) for instruction. For two single periods this time would total 20 minutes; for double periods, the time would be 10 minutes. Second, they believed that pupil achievement would be more than doubled, by reason of the longer practice periods.

The class schedule for industrial arts was changed to the double period the last semester of the school year 1934–35. This study concerns the classes in eighth-grade printing in the Holy Family School. A comparison is made in the single-period plan with that of the double-period plan.

The Experiment

It was impossible to make this study with a controlled group and an uncontrolled group. I.Q. records could not be studied, as such do not exist in the Holy Family School. It is impossible to compare the 1933–34 group with that of the 1934–35 group. However, from the records presented in Tables I and II, it can be seen that the achievement of both classes is nearly the same for the first semester. Each group seemed about on the same level for amount of work done in other industrial-arts subjects. The achievement within the groups for the first and second semesters is compared. Pupils were arranged alphabetically, and the first 20 of each group was considered a fair sampling of the class.

TABLE I
Holy Family School, Eighth Grade
1933–34
One Period a Week, for Two Semesters

Pupil	*Type Lines Set First Semester*	*Type Lines Set Second Semester*
1	49	80
2	35	40
3	12	20
4	63	71
5	24	27
6	24	18
7	21	30
8	14	33
9	32	46
10	21	33
11	24	27
12	32	46
13	44	52
14	40	47
15	32	43
16	32	45
17	28	32
18	30	24
19	16	26
20	49	85
Averages	31.1	41.2

The Results

Table I shows the results of the work done in number of lines of type set in the 1933–34 Holy Family class in printing. For the first semester of that year, the average achievement amounted to 31.1 lines set. In the same class, for the second semester, the average number of lines set was 41.2. This showed an average increase in achievement of 9.9 lines of type set over the first semester. This class attended the printshop for one period a week for both semesters.

In the school year 1934–35, a similar class of eighth-grade pupils from the same school attended the printshop for one 40-minute period the first semester, and a double period of 80 minutes for the second semester. Referring to Table II, we find

TABLE II

Holy Family School, Eighth Grade
1934–35
One Period a Week, for One Semester
One Double Period a Week, for One Semester

Pupil	*Type Lines Set First Semester*	*Type Lines Set Second Semester*
1	30	72
2	16	44
3	57	300
4	42	202
5	63	202
6	32	80
7	42	223
8	44	200
9	42	155
10	32	202
11	32	111
12	54	211
13	49	170
14	32	68
15	60	237
16	35	153
17	35	145
18	30	94
19	35	109
20	35	99
Averages	39.8	153.8

that this class set an average of 39.8 lines the first semester, and an average of 153.8 lines during the second semester.

The same teacher was employed for all groups, and the teaching method remained constant.

Attitudes

The writer could find no data from studies of this nature in the industrial-arts field. However, in a kindred work, that of household economy, ". . . it is believed by many that [even] 60-minute periods are not sufficient time to give adequate attention to each pupil, and that consequently the girls get into poor habits of workmanship. . . . The pupils and teacher are working under a nervous strain at great speed, which is not desirable. Short periods [60 minutes] are not thought to be entirely satisfactory by either teachers or pupils."[1]

Readings in studies of the longer periods of classes both in academic subjects and shop subjects, reveal a tendency for administrators to lengthen the periods. A survey by Puckett[2] shows that the median length of shop-class periods was 85 minutes in 104 schools. Only 2 had 40-minute periods; 35 had 90-minute periods, and 14 had 80-minute periods.

An increasing popularity of the lengthened class period for academic subjects is shown in the summaries of the Annual Reports of Secondary Schools accredited by the North Central Association for the years 1930–32. The figures show a gain of approximately 44 per cent in the number of schools using a lengthened period. In 9 academic subjects, the group of pupils having the longer recitation was superior, Denman's report[3] shows. The differences are statistically significant in the 6 subjects — algebra, American government, American literature, English literature, plane geometry, and United States history. "The findings of three studies," say Denman and Kirby, "afford rather conclusive evidence of the value of the long period in securing higher achievement in the subjects considered in the schools involved."

Bonser[4] believes that the work in industrial arts in any junior-high-school year should not have less than four periods a week. The time for classwork, he believes, should not be less than for any other junior-high-school study — mathematics, history, science, or English. Bonser's opinion, then, would militate against even the double period for printing in the junior high school, or only two periods a week. Industrial-arts teachers heartily agree with this.

The findings of still another series of studies point to rather conclusive evidence of the value of the longer period in securing higher achievement. "The results supply some justification for the changes to the longer recitation period that have already taken place, and they afford the administrator who may be contemplating the periods, substantial reasons for making the change."[5] (Long periods were 55 to 65 minutes; short periods were 40 to 45 minutes in length.)

In considering the lengthening or doubling of class periods in the junior high school, we must consider the factor of fatigue. According to Pyle,[6] "Mental fatigue of school children is less than generally believed. Decrease in quantity of work is usually due to boredom or unhygienic conditions, rather than to fatigue." However, until the eighth grader has become habituated to holding the composing stick and setting type, he should be allowed rest periods. These can easily be taken care of by breaking up long periods with short lectures by the teacher, while the pupils are seated. These lectures should be continued for several weeks until the boys are habituated to the work. "Fatigue," says Pyle, "comes much more quickly in non-habituated work than in habituated work."[7]

Let it be granted that this type of instruction in junior-high-school printing is the right procedure, as we cannot enter into a discussion of the objectives of such a course in this article. Many boys follow up printing as an elective in the ninth grades, and others follow it into the trade school and senior high school. It is important, then, to have sufficient overlearning in the eighth grade in order to avoid the relearning of the fundamentals in the higher grades. This overlearning can hardly be done in one 40-minute period a week. Pyle states that "the rate of forgetting depends upon the degree to which the material has been learned. Overlearning makes forgetting slower,"[8] and "When learning is carried to a high degree of perfection, by a large number of repetitions, it persists with greater tenacity."[9]

Conclusions

The tables of achievement presented show that by doubling the class period in junior-high-school printing, the average increase is about three times that of the single-period plan of scheduling. This is due to:

1. The saving of the starting time of approximately five minutes, in getting out type cases, and gathering materials for work;

2. The saving of approximately five minutes of clean-up time;

3. The overlearning which carries to the next double period, as contrasted to the learning which is forgotten partially before the next class printing period;

4. The increase of practice periods which makes the boy more skillful in his typesetting.

The facts presented and the theories applied show conclusively that the double period increases by at least three times the achievement of the pupils of the particular class in the given school.

[1] June P. McAdam, "Single Period Classes in Home Economics," *Journal of Home Economics*, January, 1931.
[2] R. C. Puckett, "Length of the High School Day," *American School Board Journal*, May, 1932.
[3] G. E. Denman and T. J. Kirby, "Pupil Achievement in High School." *The School Review*, April, 1933.
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[5] "The Length of the Period and Pupil Achievement in High Schools." *The School Review*, April, 1933. pp. 284–289.
[6] Pyle, H. P., *The Psychology of Learning* (Baltimore: Warwick & York, 1928), p. 355.
[7] *Ibid.*, p. 357.
[8] *Ibid.*, p. 199.
[9] *Ibid.*, p. 205.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

Benjamin Franklin

On January 17, America will celebrate the 231st anniversary of the birth of one of her most famous sons — Benjamin Franklin. This will be of special interest to all those who are engaged in or are interested in the art of printing. Because of this, the program of the 1937 Printing Education Week, sponsored by the National Graphic Arts Education Guild, will be concerned largely with honoring the memory of this great man.

While Franklin was a printer by trade and became famous for the work which he did as a printer, writer, and publisher, nevertheless, this versatile man has so much claim to the esteem and respect of every American, that a short study of his life may well be used in every school shop of this country. INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, therefore, gladly devotes this editorial page to a rather meager account of the life of this important personage.

He was born in Boston, on January 17, 1706. His father was a tallow chandler and soap maker. Benjamin was entered in the grammar school at the age of eight. When he was nine, he was sent to Brownell's school for writing and arithmetic. At the age of ten, he was indentured as an apprentice in his father's business. Franklin could not, it seems, become interested in his work. His romantic spirit yearned for a life on the sea. His observant father, afraid that Benjamin might imitate his elder brother and run away, tried to interest him in some other business which might catch and hold his fancy. Finally, he apprenticed him to Benjamin's half-brother, James, who was conducting a printing establishment at Boston. Printing seems to have captured and held the interest of the twelve-year-old apprentice. While of sturdy and athletic build, he nevertheless was inclined to be quite bookish. He read every book he could lay his hands on, among them *Pilgrims' Progress, Plutarch's Lives,* and an old volume of *The Spectator.*

His reading seems to have prompted young Franklin to try his hand at writing. After finishing the first essay, he slipped it under his brother's office door. It promptly appeared in the *New England Courant,* which was published by James. Other essays followed, all of which were printed until the identity of the writer was accidentally learned. Not only was Benjamin informed that his future essays would not be published, but he also was scolded for his daring. Conditions between the two half-brothers became unbearable and finally Benjamin ran away. The seventeen-year-old printer presently found himself friendless and with little money in Philadelphia. He quickly found a job with a printer by the name of Keimer. Here his industry and ability made such an impression that William Keith, governor of Pennsylvania, sent him to London to buy equipment for a printing establishment. When Franklin arrived at his destination, the money and letters of credit and introduction, which Keith had promised, were not forthcoming, and again he found himself in a strange city, without money and without friends. He at once looked about for a job as printer and was successful in obtaining one at Palmer's printing house where he spent about a year, and then at Watt's printing house. But he seems to have yearned to be back in America and we find him returned to Philadelphia in October, 1726, having spent about nineteen months in England.

His first job, upon his return, was with a wealthy Quaker merchant, Denham by name. Franklin was both clerk and bookkeeper in Denham's store, when a few months later both he and his employer became ill, and Denham died. Franklin then returned to his early love — printing — and to his first employer, Keimer, who had him conduct the printing establishment while he took care of the selling of books and stationery. A year later, Benjamin Franklin was able to open his own printshop. His industry, common sense, and frugality helped him to build up such a flourishing business that he was soon known throughout the colonies.

In 1730 he became the public printer for Pennsylvania. It was in this year also that he married Deborah Reed. A son and a daughter were born out of this union, the son, however, dying at the age of four.

In 1736, he was made clerk of the Pennsylvania Assembly. It was in this year also, that Franklin inaugurated the first fire company in Philadelphia. In 1737, he received the appointment as postmaster of Philadelphia. In spite of the additional work which these political positions heaped upon him, he did not lose sight of his work as printer and publisher. His far-sighted business sense was not content with having the largest printing establishment in Philadelphia. He also established printing houses in New York; Charleston, S. Car.; Kingston, Jamaica, and later in Boston and New Haven. In 1748, he entered into partnership with David Hall. It was from this time on that he had more leisure to enter into the study and experimental research of the natural sciences, with the result that he invented a new kind of stove, formulated a new theory of electricity, proved the identity of electricity and lightning, invented the lightning rod, and formed the basis for the many scientific papers which he wrote. He had, however, always been interested in science as is evident from the fact that as early as 1743 he had founded the American Philosophical Society.

Politically, too, he was more and more active. In 1748, he was elected member of the city council, and in 1750, he was made a member of the Pennsylvania assembly, a position which he continued to hold for fourteen years. He was instrumental in forming organizations of volunteers for the defense of both city and province, conferred with the Indians, aided General Braddock, and organized the northwestern frontier in defense against the Indians. As deputy postmaster-general of America, he was successful in placing the American post office into a position where it actually paid a profit to the English administration. He also established "The Academy and Charitable School of the Province of Pennsylvania" out of which later grew the University of Pennsylvania.

He was sent to England on several missions for his country so that he became equally well known in both the new and the old worlds. In 1764, he again was sent to England for the purpose of asking the king to take over Pennsylvania as there was continual bickering between the province and the Penn family who held its charter. While he was carrying on these negotiations, the Stamp Act was imposed on the Colonies. It was largely due to his efforts that it was repealed in 1776. This work brought him into such prominence that both Georgia and Massachusetts asked him to be their representative in London.

When the Stamp Act was succeeded by other methods of taxation equally obnoxious to the Americans, Franklin fought valiantly against them. He exposed the duplicity of some of the American Tories, especially of Governor Hutchinson of Massachusetts, but they were powerful enough to cause him not only to lose his position as deputy postmaster-general, but even to put him in imminent danger of arrest.

When he returned to America, all the influential Tories were pitted against him, but the colonists made him a member of Congress and elected him as their postmaster-general. He also was appointed as one of the three commissioners sent by Congress to Canada for the purpose of asking that country to make common cause with the colonies. This mission being unsuccessful, he returned to Philadelphia. He presided at the constitutional convention and was a member of the committee that framed our constitution. While the honor of writing this famous document goes to Jefferson, Franklin must be given credit for having corrected the original draft.

Next, he was sent to the court of France, where he was successful in raising both money and men to assist the hard-pressed colonists. In 1781, he was appointed a member of the commission which negotiated and brought to a successful culmination the treaty of peace between the United States and England. In 1785, Congress accepted his resignation as minister to France and he returned to Philadelphia to be elected president of the Commonwealth of Pennsylvania, which position he held for three terms. In 1787, he was made a delegate to the constitutional convention. He holds the distinction of having signed the Declaration of Independence, the Treaty of Alliance with France, the Treaty of Peace with England, and the Constitution of the United States.

Having grown old in the service of his country, he died after a short illness in Philadelphia, on April 17, 1790. He is interred in the burial ground of the Old Christ Church in that city. His was a truly remarkable life. Honors were showered on him both at home and abroad. The Royal Society of London had elected him to membership and both Oxford and Edinburgh conferred honorary degrees upon him. He was loved by his countrymen. As a matter of fact, it may be truthfully said of him that the position which he held in the affection of his countrymen was second only to that held by the great George Washington.

Building A Safety Concept

Noel B. Grinstead

Central Missouri State Teachers College, Warrensburg, Missouri

Building proper safety concepts must be the aim of every shop teacher, be he in the field of the industrial arts or of vocational education.

Safety is to a considerable extent a manner of thinking. A habit of safety may be developed by experience, by instruction, by the use of cautions, guards, slogans, posters, penalties, or a number of other schemes or devices, all undoubtedly having some value in encouraging safe practice. But the efficiency of any device or method of instruction in teaching people to be careful depends largely upon the extent to which the device helps to build up a point of view on how to go about any hazardous task in the best and least dangerous manner. The safety concept may be developed in the school through regular instruction only when it is a part of the teacher's plan in giving instructions which properly emphasize a safe procedure to be followed, and to analyze the reasons for this procedure. Supplementary rules, devices, posters, placards may be found effective, in varying proportion, as aids in some teaching situations, with different teachers or working conditions.

If we are going to build up the complete safety concept, we must have a plan for doing it. The plan presupposes some connected thinking by the shop teacher. He may study the nature of hazards, classify them as to their likelihood of occurrence and plan the means that may be used to reduce occurrence to a minimum; devise steps that may be taken to avoid recurrence; analyze accidents that have happened so that he may gain ideas on the furtherance of safety knowledge; check the value of his safety instruction, and work out his own methods for thoroughly establishing the concept in the minds of the students. It is contended here that a considerable portion of the job of teaching safety is contained in the teacher's regular plan of instruction in which he takes every useful opportunity to develop an appreciation of the need for doing all work in the most economical and most careful manner.

Hazards in the school shop should be thought of as threefold. There are hazards to the worker, hazards to the tool or the machine being used, and hazards to the material being fabricated. Perhaps, too, many teachers emphasize the former hazard almost to the exclusion of the other two. In doing so, they lose splendid opportunities to round out a comprehensive view of the problem. It is hardly possible to build up a complete, usable, understandable practice of safety, unless we include both the practice that will be best for the operator, and encourage the habit of looking for potential dangers to the things with which the operator works. Some simple illustrations show the close interrelation between the phases of the threefold view of hazards, although we can see that it is possible for any one phase to operate independently in a given accident. The material, for instance, may be damaged without resultant injury to the worker or machine, but as a general rule, when the material or machine is damaged, the peril of the worker is increased. In thinking out the operation of ripping with a circular saw, we know that the serious element of danger primarily surrounds the individual, but we form a more inclusive interpretation of hazards if we also envelop the machine and material in our plans. The skeleton of our thinking would be somewhat as follows:

Considerations for the operator — adjusting height of the saw, placing the guard, locking the fence and mandrel, using push and guide sticks, feeding the saw properly.

Considerations for the machine — selecting the proper and sharp saw for the job, adjusting height so that the saw will not burn, inspecting material, feeding carefully.

Considerations for the material — negligible under normal conditions, but dependent upon the size, kind, and amount of material being ripped. A dull saw, for example, may give the desired result, but it may stick, throw back, wobble on the mandrel, or otherwise perform irregularly and endanger all three — the worker, the machine, and the material. Another example is of the type where the major danger is to the material, as in surfacing pieces of stock which are too short to reach from the center of the feed rolls to the center of the delivery rolls. Here the wood is almost certain to be damaged, and when it turns sidewise in the machine and is unsupported as the knives strike it, splinters may be thrown back into the hands of the operator.

Reasons for irregular performances must be thought out and the cause of accidents anticipated. Thus an accident is often avoided by using well-planned, commonsense procedure rather than by following rules. In jointing, sawing, turning, or in any other of the semi-hand-control operations, the worker must keep in mind the need for maintaining the mechanical advantage over the tool or material. In jointing we may measure the width of the gap or throat between tables (over the cutter head) and joint only stock of such length as will allow two or three times as much supported material on the table as is unsupported over the head. This is not a rule, but an example of how we must think out the reasons for certain restrictions that we set up for students. We should not set a lower limit of 8 or 9 in. in length for wood to be jointed without demonstrating the reasons for that minimum, and cautioning students that the wider the piece, the greater the length must be for safe performance, due to the increased pull of the knives on a wide cutting area. To set the lower limit of length too high would be to encourage transgression, so it is a vital point to make reasonable requirements that will be met by student operators because they appeal to their judgment as being right and fair.

Grinding operations present continuous hazards to the eyes and hands of the worker, therefore, precautions such as the use of shields, goggles, rests, and guards come to mind. There is danger to the grinder if material should be allowed to jab the face of the wheel, if the side is used when the face should be used, if soft metal is allowed to clog the grit. Some of the dangers to material may be in overheating, worker losing control, misforming, or in grinding the work undersize. Again the close relationship between the phases of hazard is apparent. There is no doubt that our concern about the operator exceeds our anxiety for the tool or the work, but if we think only in terms of the operator, we lose sight of some real hazards to him. A metal-clogged grinding wheel is a damaged machine, at least temporarily and in the sense that it cannot do its most effective work, and if someone uses the wheel in this condition, there is greater danger of personal injury than in using a sharp wheel.

Another phase of general safety consciousness that we try to build up, lies in an understanding of the mechanism of the machine, the nature of materials, and the theory of the cutting action of tools. Some teachers argue that, as factors in safety, these points are remote. However, the intelligent, and informed worker knows that equipment in good condition, efficiency in the school shop, and safety cannot be separated. It is a good argument that one

of the elements of good procedure is safeness, so most procedures in the school that are not safe are not good. We have used a series of questions on machines, the answers to which bring to the students' attention the design, mechanism, and the purposes of various setups, locks, adjustments, speeds and capacities of machines. The intent of these questions may reach far beyond their aid in developing safe workers, but they help to do that. A knowledge of the nature of metals in a molten state and their reaction under certain conditions is safety knowledge. Knowledge of the cutting action of a skew chisel on a lathe, or a tool in turning steel, is helpful in establishing the thought of safe and right use. There are dozens of illustrations occurring in some shop every day.

The workmanlike attitude is important. Proper stance is to be stressed, even in the simplest operations. Concentration on the job at hand, keeping the eyes on the work, position of the hands, making adjustments only on a machine that is standing still, checking setups before starting the work, working within the capacity of the machine — all these are points that can be given direct emphasis. In this connection it will be kept in mind that people learn a great deal by observation and imitation, so it is of much consequence for the teacher to use his equipment carefully and properly under all conditions in spite of the fact that more liberties are allowable to the experienced worker than to the beginner. The teacher must remember always to follow his own instructions. There are a few cases where observation of industrial workers by students is detrimental to the teacher's safety program. To the skilled workman who does the repetitive type of operations, certain practices are commonplace, and apparently risks are taken which would be very dangerous for the learner in school who lacks the practice and repetition for the work to become habitual and automatic.

Safety learning is specific. One may have his own opinion about the use of slogans, warning signs, pictures and rules, but their value probably increases in proportion to the extent to which specific application may be made of them. We learn safety just as we learn other things, through a number of elementary and quite specific experiences and not by having before us a general caution to be careful. A safety-first sign would be of comparatively little value to a person who understands so little about a machine that he cannot know of what he should be careful. But if a slogan or sign points out some one of the dangers that surround the machine, it has more tangible value than the sign which emits a blanket admonition. We do not learn to use a universal saw safely unless we learn the elements of safe procedure in every different operation that is done on that machine — ripping long boards, ripping narrow or short boards, several methods of cutting off for length, dadoing, tenoning, grooving. Every tool and machine operation involves its own peculiar set of safety measures of the threefold nature, and knowledge of all these measures combined comprises the general attitude of safety. When this attitude is fairly well established it is likely that devices will be found useful as reminders, and, as pointed out, in proportion to the degree to which they refer to a specific recommendation. The general type of safety precaution may be of more importance to the new and inexperienced worker, or to the passer-by, than to the informed worker. A realization that proximity is hazardous may be all that is intended and sufficient for the observer. Even so, the person who knows nothing of electrical current likely has a greater respect for warning that reads "Danger — 22,000 Volts" than he has for one that contains just the commonplace "Danger" warning. The wording of cautions should direct attention toward a specific danger, when possible, giving some little information to satisfy the curiosity of the passer-by. The layman may be somewhat awed by thoughts of electricity and the inherent dangers, so he would give a large belt-driven machine a wider berth if his attention were called to the danger from static electricity rather than the possibility of getting his clothing or himself entangled in the belt. It is not so likely that he would want to risk the electric shock just to "see how it feels." Neither would he want to fall into the belt, but the thoughts of the shock encourage him to keep his distance. The sign at the front gate that says "Keep Out — Dangerous Dog" has influenced the decision of many a would-be stopper. It is specific enough to be respected, and even though the truth of the statement may be doubted, sufficient information is contained in it to get the desired result.

There is the type of hazard, the effect of which is cumulative. In some instances, the exposure of the student in school to the cumulative type of hazard is not of sufficient duration to cause any particular concern to the teacher, but it must be called to the attention of the student. Such dangers as lead poisoning or functional disturbances among printers and painters may be relatively uncommon and of slow development, but the teacher cannot neglect his job by failing to state the precautions to be taken in avoiding these troubles. Of more immediate cumulative danger is the possible injury to the eyes in mechanical drawing caused by working with the eyes too close to the board, failure to shift the glance, or to give the eyes relief by blinking them or looking afar occasionally. There are cumulative hazards in almost all forms of industrial-arts work, including dangers to the equipment and to the worker from dust, fumes, accumulations, and so on. It would be advisable for the teacher to look for all possible immediate and long-range exposures to which he and his students are subjected, then modify his teaching, his methods, equipment, or even teaching content so that much of the removable danger may be eliminated.

The teacher is somewhat responsible for a number of other factors which, if they are not actually a part of instruction, are closely tied in with it. There must be freedom from outside interference, bodily or mental, as nearly as possible, suitable clothing must be worn for the job at hand, visibility of work should be assured, equipment should be selected in terms of the age of the students and the nature of their work and it must be arranged advantageously. Personal habits, formed before the boy comes to the shop should be looked for. Some boys have a habit of leaning, some cross their legs, even while operating a machine, some have not developed the ability to concentrate and to disregard traffic passing along, and thus they become careless or confused in the presence of others. The athlete's ability to see "out of the corners of his eyes" is useful to shop workers in that they may be conscious of the movements of nearby people without distracting their gaze or attention from their own work. The boy working at a machine, like the driver of an automobile, must, for his own safety and that of others, watch the other fellow, himself, his work, and his machine.

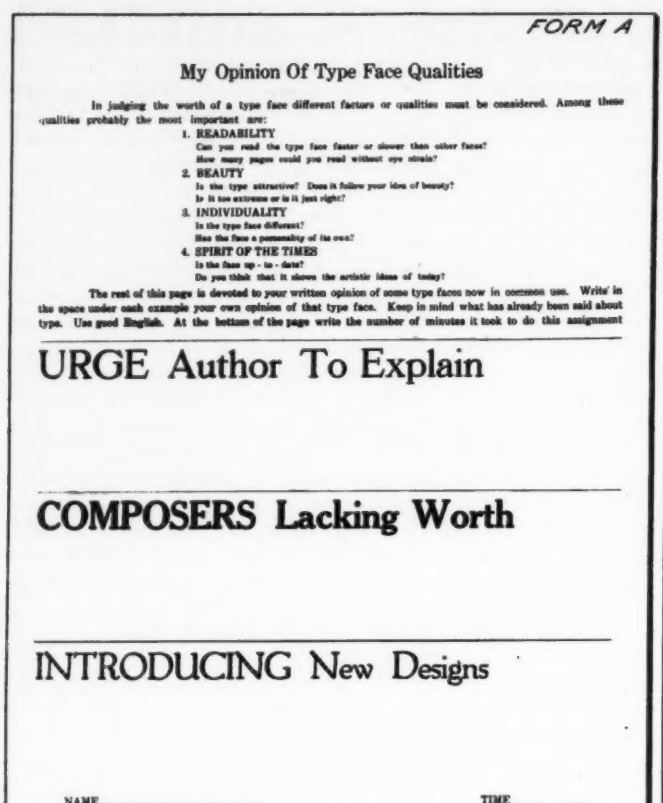
Rating Scale Assignment Sheet

Kenneth E. Parr
Shop Instructor, Becker, Minnesota

The results of this interesting study may tempt other shop teachers to make experiments of this kind.

In making an assignment, one must consider the following important points:

1. Is the assignment objective? That is, can the student readily understand what is wanted; can the student complete the work without help; and can it be easily corrected?



FORM A

My Opinion Of Type Face Qualities

In judging the worth of a type face different factors or qualities must be considered. Among these qualities probably the most important are:

1. READABILITY
   Can you read the type face faster or slower than other faces?
   How many pages could you read without eye strain?
2. BEAUTY
   Is the type attractive? Does it follow your idea of beauty?
   Is it too extreme or is it just right?
3. INDIVIDUALITY
   Is the type face different?
   Has the face a personality of its own?
4. SPIRIT OF THE TIMES
   Is the face up - to - date?
   Do you think that it shows the artistic ideas of today?

The rest of this page is devoted to your written opinion of some type faces now in common use. Write in the space under each example your own opinion of that type face. Keep in mind what has already been said about type. Use good English. At the bottom of the page write the number of minutes it took to do this assignment

URGE Author To Explain

COMPOSERS Lacking Worth

INTRODUCING New Designs

NAME_____ TIME_____

Fig. 1. Original assignment sheet

FORM B

My Opinion Of Type Face Qualities

In judging the worth of a type face different factors or qualities must be considered. Among these qualities probably the most important are:

1. READABILITY
   Can you read the type face faster or slower than other faces?
   How many pages could you read without eye strain?
2. BEAUTY
   Is the type attractive? Does it follow your idea of beauty?
   Is it too extreme or is it just right?
3. INDIVIDUALITY
   Is the type face different?
   Has the face a personality of its own?
4. SPIRIT OF THE TIMES
   Is the face up - to - date?
   Do you think that it shows the artistic ideas of today?

KEY KEY

The rest of this page is devoted to your written opinion of some type faces now in common use. Under each specimen are listed the items just mentioned, and after each are ten numbers. If the sample has a high degree of Readability check one of the larger numbers after "Readability". If it cannot be read easily check one of the smaller numbers. Do it the same for "Beauty", and so on. If you check "1" it means that the type is unsatisfactory in that respect. If you check "10" it means that it is nearly perfect. You will notice that there are three samples to be judged in this way. Keep in mind what has already been said about the type. At the bottom of the page write the time required to do the assignment.

URGE Author To Explain

READABILITY	1	2	3	4	5	6	7	8	9	10
BEAUTY	1	2	3	4	5	6	7	8	9	10
INDIVIDUALITY	1	2	3	4	5	6	7	8	9	10
SPIRIT OF THE TIMES	1	2	3	4	5	6	7	8	9	10

COMPOSERS Lacking Worth

READABILITY	1	2	3	4	5	6	7	8	9	10
BEAUTY	1	2	3	4	5	6	7	8	9	10
INDIVIDUALITY	1	2	3	4	5	6	7	8	9	10
SPIRIT OF THE TIMES	1	2	3	4	5	6	7	8	9	10

INTRODUCING New Designs

READABILITY	1	2	3	4	5	6	7	8	9	10
BEAUTY	1	2	3	4	5	6	7	8	9	10
INDIVIDUALITY	1	2	3	4	5	6	7	8	9	10
SPIRIT OF THE TIMES	1	2	3	4	5	6	7	8	9	10

NAME Profile Key TIME 35 Minutes

UNIVERSITY HIGH SCHOOL PRINT SHOP

Fig. 2. Rating-scale revision

2. Is there enough educational outcome to justify the time spent?

3. Is the assignment interesting to the student?

As student teacher in the University of Minnesota High School, the author decided to change an assignment to the form of a rating scale in an effort to discover whether certain of the above points could be better met with the "rating-scale" assignment. The assignment chosen was one used in the printshop entitled "My Opinion of Type Faces." Its purpose was to develop an intelligent appreciation of type faces.

The original sheet, Form A, contained three sample type faces plus directions to the student. The student's reaction to each face was then written in the space provided under each sample face (see Fig. 1).

The rating-scale revision, Form B, was identical in all respects except that a rating was to be checked for each of the factors of readability, beauty, individuality, and spirit of the times, all of which must be present in good type faces (see Fig. 2).

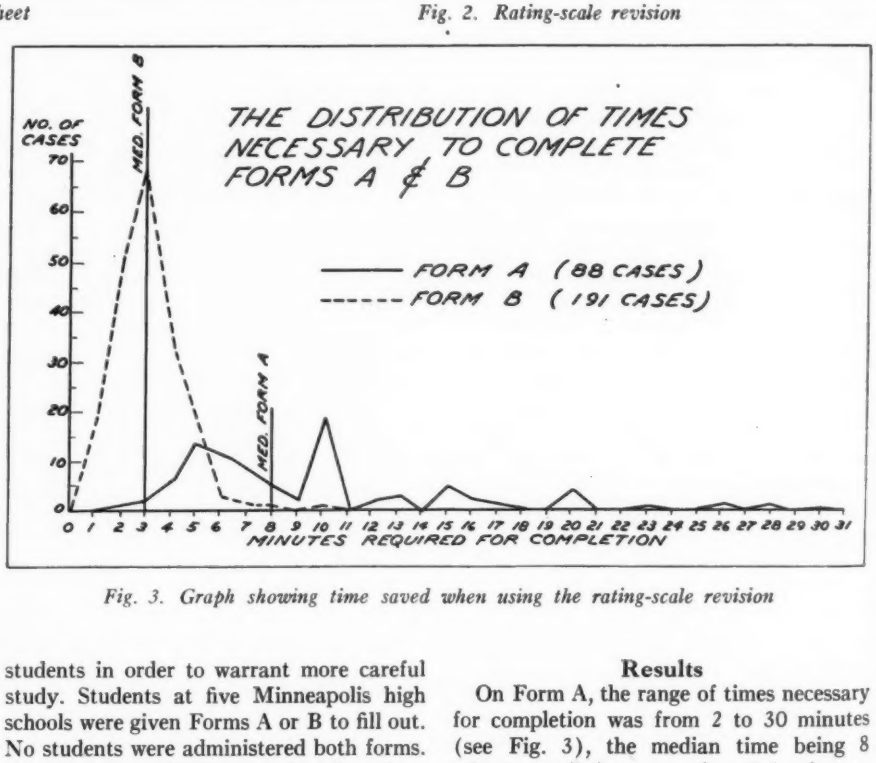

NO. OF CASES
70
60
50
40
30
20
10
0
MED. FORM B
MED. FORM A
THE DISTRIBUTION OF TIMES NECESSARY TO COMPLETE FORMS A & B
FORM A (88 CASES)
FORM B (191 CASES)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
MINUTES REQUIRED FOR COMPLETION

Fig. 3. Graph showing time saved when using the rating-scale revision

Method Followed

As the original purpose was only to develop an assignment to a usable stage, experimental procedure was not followed. However, as the results from the two forms as assigned to our class varied greatly, it was decided to give the assignment to more students in order to warrant more careful study. Students at five Minneapolis high schools were given Forms A or B to fill out. No students were administered both forms. The sheets were filled out during class time, after the directions were read by the instructor and by the students. Eighty-eight copies of Form A and 191 copies of Form B were received correctly filled out.

Results

On Form A, the range of times necessary for completion was from 2 to 30 minutes (see Fig. 3), the median time being 8 minutes and the mean time 9.5 minutes. Some students perhaps thought a short time spent on the assignment would signify a desirable trait, as the author tried to recopy the "three-minute papers"

and found it impossible to finish in that time. The median of 8 minutes seems to be the best measure of central tendency.

A list analyzing the written responses to Form A was compiled. If the students had given total responses on each of the four criteria, there would have been 12 responses on each sheet, and a total of 1056. Actually, 799, or 75 per cent, of the possible responses were received. The responses themselves were variable. Typical responses ranged from such common indefinities as "It is attractive," "has a personality," "It has beauty," and "Yes," to a very few better statements such as "Attractive, but not beautiful," "Most beautiful in my knowledge," and "Nearly homely." There were 30 responses comparing in some respect one face with another. These should be classed as better responses. Sixty-one miscellaneous responses as to where the face could be used, and comment about construction of the type face were also given. Summing up these better written responses gives a 9-per-cent return of worth-while response.

On Form B, the rating-scale revision, the range was 1 to 10 minutes with the median at 3 minutes, the mean at 3.01 minutes, and the mode at 3 minutes. Doubtless, the printed directions were not satisfactorily prepared, as the time was not filled in on some papers. On this form there was a 98-per-cent response to the criteria to be checked.

The results of the student's ratings were compiled and prepared into a rough profile key shown in Figure 2. The key shows the position of the median rating value given by the 191 cases to each of the factors considered for each face. It also shows the general position of the first and ninth deciles in each distribution. In the subsequent classroom use of this rating sheet, all judgments lying outside of the decile limits were studied, and, if necessary, the student was consulted as to the reason for his variance with the tendency shown on the key. The reader should not get the thought, however, that rigid conformity to the median judgments was the aim of the assignment.

Conclusion

Form B was filled out in 38 per cent of the time necessary for Form A, and Form B got a 98-per-cent totality of response contrasted with a 9-per-cent response on Form B. It is clear that Form B, the rating scale, provides a great saving of time for both student and teacher. The rating scale offers a more objective way of treating assignments of certain types. The student also participates more in the rating-scale assignment. Before superiority of educational outcome could be shown definitely, controlled experimentation would be necessary, but surface indications are that Form B is superior in this respect also.

An Important Use of the Device

The author has used the rating scale as an assignment device in his shop and social-science classes for the past five years. This experience has shown, particularly, one definite and important use for them. The device offers a fine opportunity to treat those things that tend to develop certain opinions, appreciations, attitudes, and intelligent judgments; something that heretofore has often been somewhat neglected and difficult to achieve and attack directly. This alone warrants its use as an instructional device by every shop and drawing teacher.

Tires and Safety

A. H. Vance

McNaughton, Wisconsin

Related material for the auto shop, but also something to think about for teachers of other subjects, who drive cars.

Tire-inspection service offers a fertile field of work for any type of automobile shop, but is peculiarly applicable to school auto shops because of the high percentage of faulty tires in regular use. Although the number of automobile mishaps directly traceable to tire faults is very small, a check-up will show that nearly 50 per cent of the cars in use have one or more defective tires. Thus, one half of all the cars one meets on the highways are potentially dangerous and an ever-present menace to safe and conservative drivers.

These tire faults range all the way from worn treads which offer poor braking traction, to actual breaks in the carcass, either already blown and protected more or less well by a boot, or ready to blow at any moment. The worn treads place definite limits on the ability of a driver to stop his car and introduce additional skidding hazards on all types of road surfaces. A potential blowout automatically limits the safe maximum speed of nearly all cars to less than 40 miles an hour. In the hands of an inexperienced driver this maximum should be still further reduced, quite often to a speed as low as 25 miles an hour.

A thorough tire inspection should begin with the tires on the car exactly as it was driven into the shop. Inflation should be first checked to make certain that the pressures recommended exist, as an underinflated tire may not show carcass defects.

Treads are first examined for wear, the object being to determine tractive ability, and also unevenness which might be caused by misalignment of wheels, overloading, or even an unequal distribution of road stresses to the carcass by poor design of the nonskid-tread projections. This latter shows as undulations in the region of the tread, usually on either side of the center, and extends completely around the wheel. Underinflation sometimes causes a similar phenomenon, the result in either case being a definite and indeterminate weakening of the tire carcass.

The tractive ability of a tire should be approximately equal to its running mate. Thus, the two rear tires should appear equal, also the two front tires should balance in this respect. If an extensive study of tire treads is planned, a direct comparison of tires can be easily made by jacking up each wheel in turn, coating a part of the tread with graphite grease or some other available coloring material, placing a paper beneath the wheel, and then allowing the weight of the car to "print" a picture of the tread. This will give not only a true picture of the tread but will also show the amount of the tire flattening under load.

A careful examination of the outside of the tire will often disclose weak spots in the tire fabric. These will show as bulges in varying degrees. Cuts, which allow moisture to penetrate to the fabric and cause a weakening of the cords by rot, can usually be easily seen while the tire is still mounted on the rim. The design of modern cars usually makes a good inspection of the side of the tire next to the car virtually impossible, hence the removal of the wheel is essential.

The mileage of a tire is of considerable value in a tire inspection, although there is a wide variation in possible maximum tire mileages, which range usually from 15,000 to as high as 35,000 miles. Thus, excessive wear on a tire may indicate poor driving ability of the driver, grabbing brakes, or clutches, or a misalignment of the road wheels. The cause of the excessive wear should be determined by allowing the regular driver to drive the car while both his driving and the performance of the

car is carefully watched. Misalignment of the road wheels is best checked by stretching a string the full length of the car parallel to the front and rear road wheels on each side in turn. For all practical purposes this is the only readily available means for checking for a rear-axle shift which not only causes excessive tread wear, but also introduces a dangerous skidding tendency because of unbalanced driving and braking strains.

Wheels should be tested for true running by means of a gauge held near the tire while the wheel is being turned by hand. Absolute trueness is not strictly essential, although it is desirable. If the wheel runs within ⅛ in. of perfect as measured on the rim, it may be considered satisfactory in the case of the larger wheels.

On rear wheels which are loose on their mountings, either the axle shaft or their bearings should be repaired, not alone for the sake of tire wear, but also for the safety of passengers and other road users. A slight amount of play is permissible in wheel bearings in order to reduce running friction and allow for expansion and contraction of the bearing units. However, this must be kept as low as possible in order to secure a car which is stable on the road. Manufacturer's specifications for bearing adjustment should be carefully adhered to when work of this nature is being done.

Poor tires will give many miles of additional wear if used during the winter months, and also, because of the lower driving speeds prevalent at this time of the year, will prove reasonably safe. The best tires should be applied at the start of hot weather, with the best two of the four being used on the front wheels. Yet, the fact that the front tires are good should not be used as an excuse for fast driving, as a rear blowout with modern balloon equipment often results in a serious accident.

The removal of casings from the rims in order to permit a thorough examination of the carcass for hidden defects is time well spent, especially for the car owner who seriously considers the safety of himself, his family, and other highway users. This is doubly true if the car must be driven at the higher speeds.

Internal inspections are made by spreading the beads well apart and exploring the entire circumference of the tire by pressing inward with the fingers. Weak spots which cannot be seen, and which often are undetectable with the tire inflated, can be easily found in this way. If spreading equipment is needed for a stiff casing, two ordinary double-end wrenches can be used. If weak spots are found some reinforcing equipment should be applied or a vulcanizing job done, and the tire used according to its apparent strength.

A Drag

R. Randolph Karch

Arsenal Junior High School,
Pittsburgh, Pennsylvania

There are various kinds of preferment, but the type worth most is that which has been earned by merit.

It was one of those lazy days in the middle of the semester, when all the reports were in, and the fellows had a little time off. They were congregated in the men's lounging room, smoking and talking.

When I entered, they were in a heated discussion about the "drag" a certain fellow had with the bosses.

"I can't see the fairness of it," said one. "Bill has been here only three years, and now they are moving him up to the trade-school job. I've been here fourteen years, and when I talk to the bosses, they just laugh, and tell me that jobs are scarce now, and I ought to be satisfied with what I have."

"Well, I've given up trying," said another. "I've been here almost as long as you have, and I can see no advancement in store for me here. When they built the new building they brought over a fellow from another state to fill the shop job I thought I was in line for. I guess the only experts they can recognize are the fellows from out of town. The fellows in the system, whom they know well, are not good enough for them."

The third piped up in a similar vein. "Well, I think I'm doing a good job, but I guess I'm the only who thinks so. Spending time around here means nothing to the administration. I guess if I had a drag like his I'd get someplace."

I was silent. I neither nodded agreement, nor agreed with them. The man of whom they spoke had a drag. He had a drag with all members of the school staff with whom he came in contact. Yet, he was related to none, he was not a handshaker, did not compliment the principal's wife, did not tell the superintendent he was right when he knew he was wrong. He was independent in politics — "stumped" for no one. *He merely did more than his job called for.* He went out of his way and worked hard, (while the other men were waiting, hat in hand, for the last bell to ring) seeing what he could do to help the school activities sail along smoothly. His supervisors visited his shop not to snoop around, but to learn something about his particular way of teaching his subject. He was always doing something new, trying out new educational methods and theories. He had no trouble with his students — no disciplinary problems — because he was fair, kind, just, and a friend to his students, and they respected him.

Yes, this teacher had a "drag" with the powers at the head of the school, but not the kind of "drag" the other teachers thought he had.

BOY CHARACTERISTICS

William W. Wills, Junior High School,
Rapid City, South Dakota

One glimpse, my lad, into your soul
To see what hides therein,
That you, as a man, will need to have
To meet the world and win.
Ah yes! you want to express yourself
In a fashion all your own.
Don't lose that trait, my little man,
It's useful when you're grown.
You need to feel each day you live
With hands and plastic mind.
Let's hope you find while still a boy
A way to meet life's grind.
You enter the realm of make-believe
And see yourself a man.
Keep on! Be brave! Be honest! Be true
To a youthful pattern.
Rhythm, my lad, you seem to admire
In all, to you, that's rife.
Cling to that sense and always try
To keep in step with life.
Yes, lad, you know that boyhood pals
Add zest to life's bright tone.
Make friends to keep or you will find
Men don't live best alone.
Why do you love to be outside
In God's great out-of-doors?
Don't fail to heed that youthful urge
And boundless health is yours.
How fine that when you barter and trade
You always try to be fair.
Never give in to gainful greed;
The world needs men who're square.
You love to hammer and saw and plane
On things of youthful plan.
Realize, my boy, that handwork will
Reveal the soul of man.
'Tis plain you have an urge to control
Machines with life and power.
Your bent must help you learn to live
In this mechanical hour.
You struggle and fight for things deemed right
In spite of boyhood fears.
Remember a man who strives for the best
Is honored in later years.
God give us knowledge and strength and will
To do the best we can
To show these lads the steps to take
From boy to foursquare man.

Problems and Projects

BACTERIA-INCUBATOR OVEN

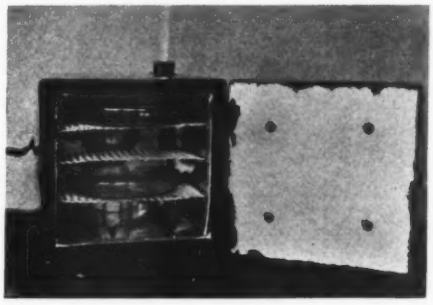
H. R. Goppert and E. Sprague, High School, Mishawaka, Indiana

The bacteria which are commonly studied in school laboratories grow very slowly at ordinary room temperatures. Raising the temperature to approximately 98 deg. F. decreases the time required for the growth of bacteria to only about one tenth that under normal conditions. This fact and a casual conversation between the teacher of science and the teacher of electricity led to the designing and building of the incubator described here.

The requirements of the device are very simple. It must hold the temperature constantly within the range between 95 and 100 deg. F., and have room for three or four Petri dishes 4 in. in diameter.

A 25-watt lamp was chosen as being the most readily available and economical source of heat, and a few experiments with a small box and a thermometer demonstrated that this size was large enough. The next thing needed was some kind of control which would keep the temperature within the above limits, and one of the tiny "Midget" thermostatic switches used in electric heating pads was chosen as being readily available, cheap, and having plenty of capacity for the purpose. The rest of the material needed — bright tin, asbestos paper, a socket, a plug, and connecting wires — is found in nearly every school electric shop.

The construction is clearly explained in Figure 1, and the job is simple enough so that almost any boy can make it. After the job is complete, a thermometer should be placed in the opening provided in the top of the oven and the lamp turned on to find the proper setting of the thermostat. A little adjustment will find the proper setting, which will then be maintained indefinitely, and the incubator is ready for use.



The incubator in use

And the final test for any project — does it work? A culture of milk which at room temperature has been taking from five to seven days to develop, reaches full growth in from 18 to 20 hours when placed in this incubator. The great advantage for a student, whether in school or in a home laboratory, is that he need not wait a week to see the results of his experiment, as he must do when the little "bugs" grow at ordinary temperatures.

TORCHIERE LAMP WITH PIERCED COPPER SHADE

Paul L. Caulwell, Public Schools, Bradford, Pennsylvania

This lamp makes an excellent general-shop project, involving wood turning, metalwork (saw piercing), and electrical work.

The shade design may be the same as the one illustrated, or an original design, drawn under the supervision and guidance of the art instructor or the shop instructor, may be used.

In order to have the shade fit accurately, it is advisable to make it first. Calculate the circumference of the base and the lid. This will be the length of the piece of copper. See Figure 1. Twenty or 22-gauge copper may be used. The first and most important step, is squaring the piece of copper very accurately, so that a good soldered butt joint can be made.

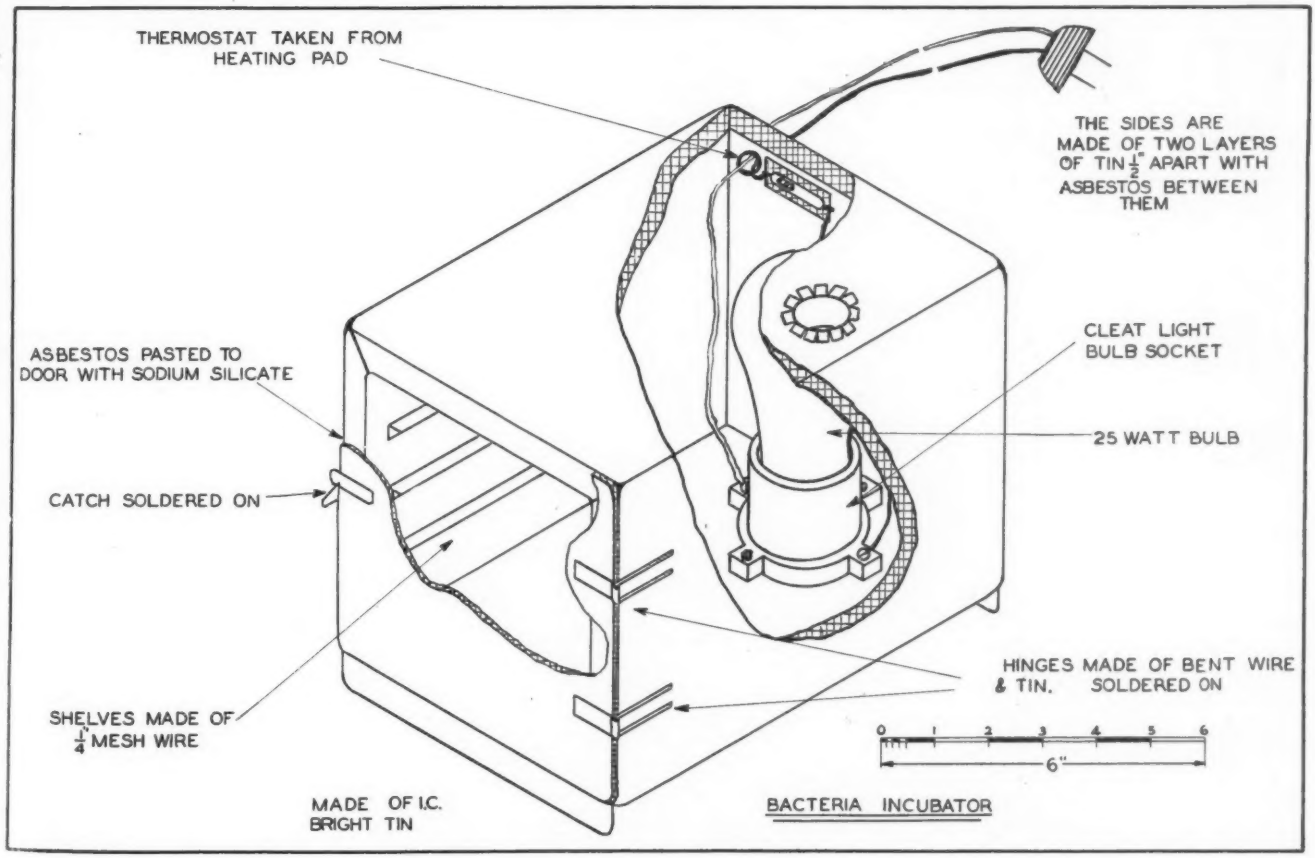

THERMOSTAT TAKEN FROM HEATING PAD
THE SIDES ARE MADE OF TWO LAYERS OF TIN 1/2" APART WITH ASBESTOS BETWEEN THEM
CLEAT LIGHT BULB SOCKET
25 WATT BULB
ASBESTOS PASTED TO DOOR WITH SODIUM SILICATE
CATCH SOLDERED ON
HINGES MADE OF BENT WIRE & TIN. SOLDERED ON
SHELVES MADE OF 1/4" MESH WIRE
0 1 2 3 4 5 6
6"
MADE OF I.C. BRIGHT TIN
BACTERIA INCUBATOR

Fig. 1. Bacteria incubator

Allow the piece of copper to remain flat and transfer the design to it with the aid of tracing paper, or trace around a cut-out pattern. Holes must be drilled in the copper to allow the saw blade to pass through. Beeswax will aid with the piercing, if the blade sticks or binds.

The ribs, running somewhat horizontally throughout the design, are placed so as to add strength to the shade and yet not to detract too much from the main design.

The edges are finally filed and smoothed. The shade is easily formed with the aid of slip rolls in the metal shop.

The method of soldering and holding the edges intact while soldering, is shown in Figure 2.

When a good strong joint has been made, clean all excess solder from the interior, as well as from the exterior of the metal cylinder. The final polish may be applied on the wood lathe. Turn a wooden cylinder and slip the hollow metal shade over it. Start the lathe and polish with fine emery cloth, steel wool, and finally with rouge. No scratches should be allowed to remain on the surface of the metal.

Drill holes in shade, as shown in Figure 3.

to accommodate screws for fastening shade to the base and lid.

Next lacquer the shade to preserve the color of the metal.

Due to the pierced open work on the shade, the interior of the light is visible. A piece of homemade parchment paper, placed inside the shade, will improve the appearance, produce a soft light, and make the shade design stand out more boldly.

The parchment may be made by treating a good grade of water-color paper with linseed oil and allowing it to dry. Then apply two or three coats of white shellac to the paper.

The base and lid are made of wood and are simple screw-chuck problems. Walnut or gumwood are the two most desirable kinds of wood for this job.

When turning the base, turn a recess, as shown on the drawing, to receive the socket. A ⅛-in. nipple is screwed into the socket, and screwed into the hole drilled for the wire. The groove on the bottom is gouged out by hand to accommodate the wire. The bushing should be placed, as shown, where the wire leaves the base.

The final and most important step on the wood, is a good finish. After carefully sand-

FIG. 1
DESIGN FOR SHADE

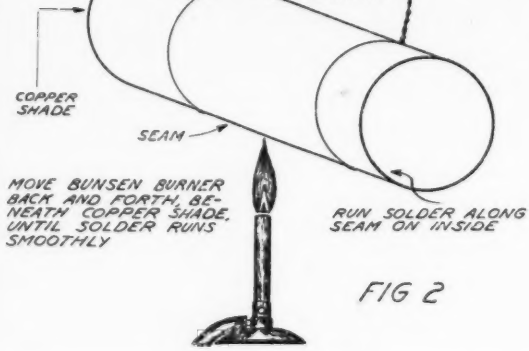
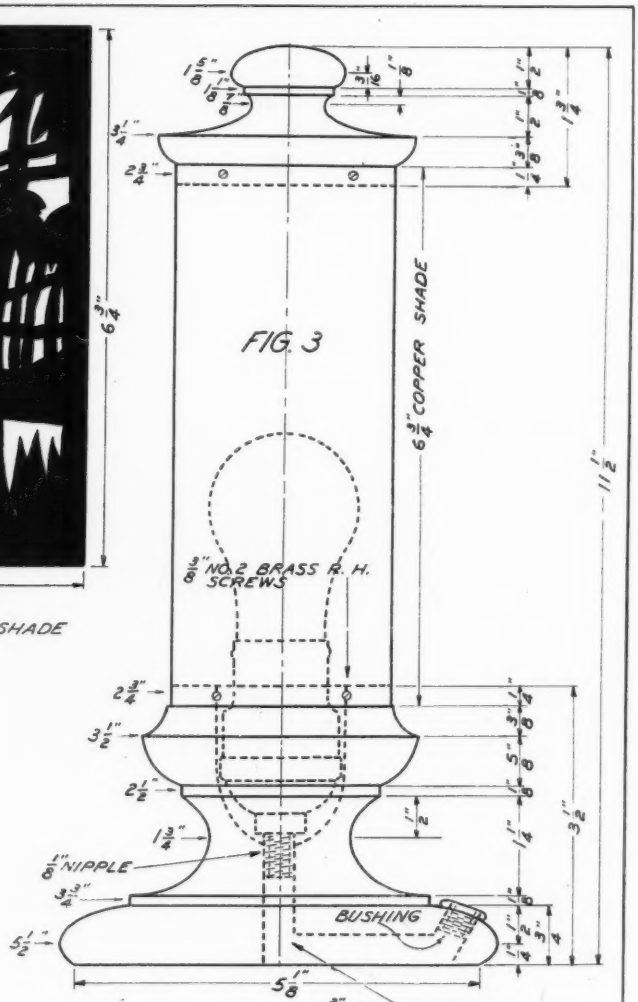

WIRE TO MAKE TIGHT SEAM FOR SOLDERING
COPPER SHADE
SEAM
MOVE BUNSEN BURNER BACK AND FORTH, BENEATH COPPER SHADE, UNTIL SOLDER RUNS SMOOTHLY
RUN SOLDER ALONG SEAM ON INSIDE

FIG 2



ing and polishing the surface of the wood, a French polish should be applied.

Saturate a small piece of clean burlap with shellac, put a few drops of ordinary machine oil on it, start the lathe slowly, and apply the burlap to the wood. As the finish becomes fixed to the wood, increase the speed of the lathe. After obtaining a good finish, allow it to dry for a few hours and apply a second coat, in the same manner.

Remove the base and the lid from the faceplates and continue to assemble the various parts.

The most convenient type of switch for this light is a cord switch.

SCOTTY BOOK ENDS

Walter C. Van Buren, Hampton, Virginia

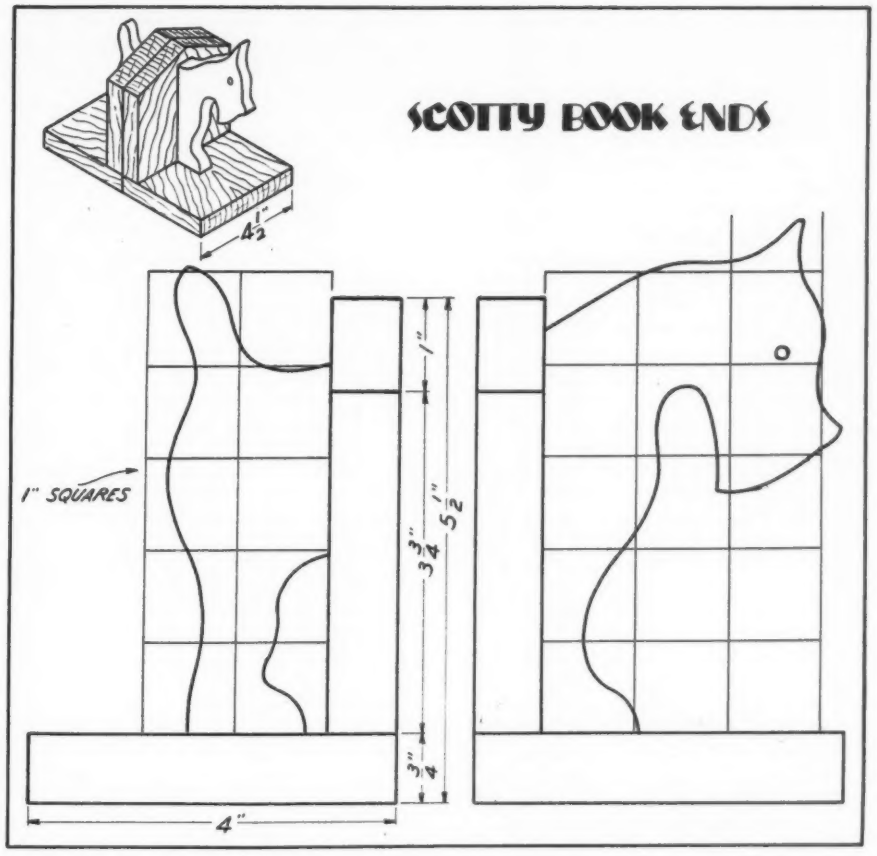
Book ends are always popular projects with boys in woodworking or general-shop classes. The more unusual or novel the design, the more popular they will be.

The scotty book ends shown in the accompanying drawing have proved to be a "hit" wherever they have been introduced. They are especially applicable to the small general shop where equipment and materials may be limited. They are so designed that, when in use, the scotty dog appears to be going directly through the books.

The book ends are made of ¾-in. walnut for the base and end pieces, and ¾-in. poplar for the front and back of the dog. The project gives the pupil experience in the hand operations of laying out, planing, sawing, and finishing. The scotty part of the book ends may be cut out with a coping saw, or if machine experience is desirable, it may be cut out on a jig saw or a band saw.

The walnut base and end pieces are finished in the natural color of the wood, and the scotty dog is enameled or lacquered black. A round white eye with a small red dot on the lower front part will look quite realistic.

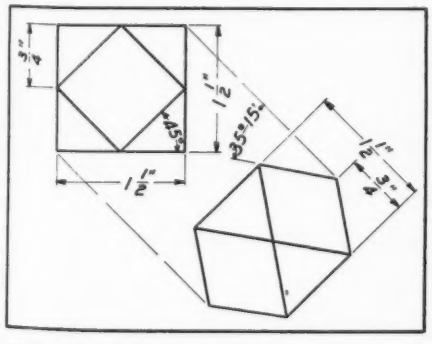
The size of the base and end pieces is about right for the size of the dog, but they may be made smaller if material of the required size is not available.



SHAPER JOB

Wm. E. Haynes, Jamaica Vocational High School, Jamaica, Long Island, New York

Aim: To teach the need of a shaper and the use of the shaper apron.



Material: Steel or brass.

Instructions:

1. Machine to exactly 1½ by 1½ by 1½ in. *Caution:* To bring out the objects of this job, the dimensions must be held to low tolerances and the angles of the sides must make exactly 90 deg. with each other, in short, a perfect cube.

2. Lay out the indicated bevels.

3. Swing the shaper vise to 45 deg.

4. Swing the shaper head to the angle indicated on the drawing, 30 deg. 15 min., with the vertical. Set shaper apron properly.

5. Rough out the bevels to within 1/64 in. of the lines.

6. Secure a round-nose or finishing tool and with a fine feed, shape to the lines, being sure to make a smooth finish.

7. Smooth with a file and emery cloth. *Be sure to keep the surfaces perfectly flat.*

"LIGHT" ON OHM'S LAW

H. J. Johnson, East Junior High School, Duluth, Minnesota

Practically every subject taught in school contains certain fundamental formulas or

First industrial-arts exhibit in Bohol, Philippine Islands. Photography by Tranquilino G ulle, Principal

rules which must be thoroughly mastered before the student can progress far in a given field. In the study of electricity, the basic law which the beginner must become familiar with is Ohm's Law.

This law is stated as follows: "The amount of current in any circuit is equal to the electromotive force of the circuit divided by its resistance." It is apparent that the reverse of this statement is equally true: "The resistance of any circuit is equal to the electromotive force divided by the current." Stated in a third form: "The electromotive force of any circuit is the product of the current times the resistance."

Since electromotive force is represented by the letter *E* and measured in the unit volt; current intensity symbolized by the letter *I* and measured in the unit ampere; and resistance, indicated by the letter *R*, is measured in ohms, the three forms of the law may be expressed as follows:

$I = \frac{E}{R}$	$\text{amperes} = \frac{\text{volts}}{\text{ohms}}$	$\text{current} = \frac{\text{electromotive force}}{\text{resistance}}$
$R = \frac{E}{I}$	$\text{ohms} = \frac{\text{volts}}{\text{amperes}}$	$\text{resistance} = \frac{\text{electromotive force}}{\text{current}}$
$E = I \times R$	$\text{volts} = \text{amperes} \times \text{ohms}$	$\text{electromotive force} = \text{current} \times \text{resistance}$

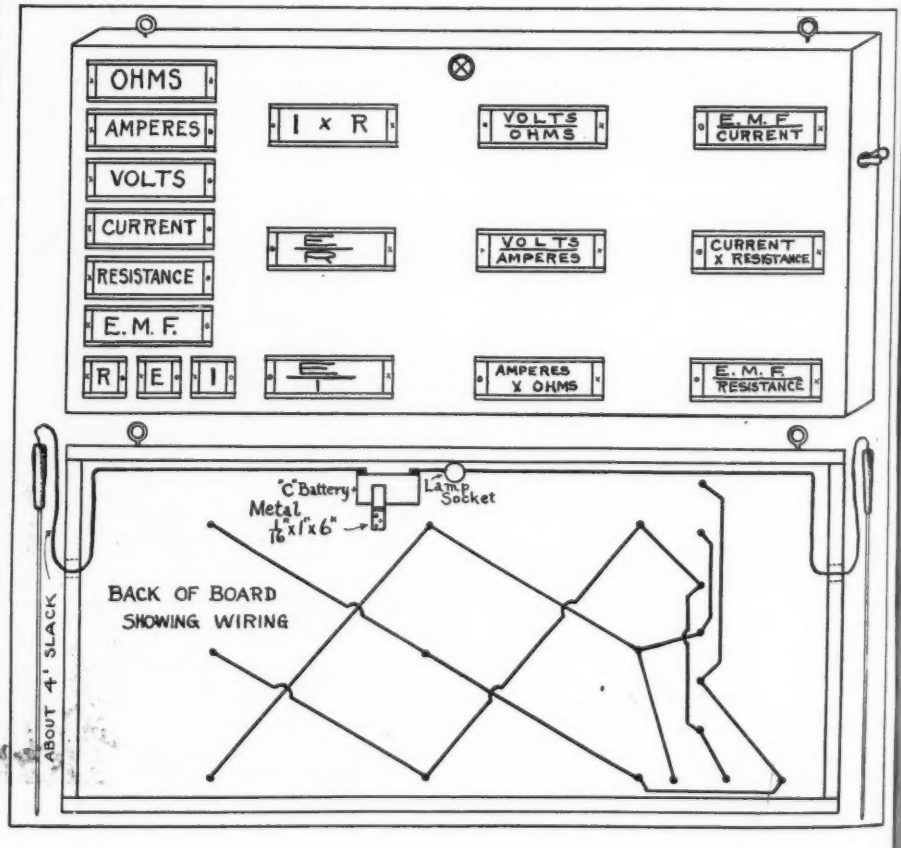
Apparently this law is simple enough to memorize and apply, but it has been found that a great deal of drill is required before the average junior-high pupil can quickly recall and apply the proper rule to a given problem. The monotony of oral drill does not appeal either to class or teacher, and in order to stimulate the mental processes and speed up the applications of these rules, the display board described herewith was devised. It has helped greatly in stimulating interest in this important law. The diagrams shown and material listed should make it easy to construct such a board. Almost all material may be found in the average school shop. The only items that have to be purchased usually are the battery and the lamp.

Bill of Material

1 pc.	½ x 18 x 36	Wood
2 pc.	¾ x 1¼ x 36	Wood
2 pc.	¾ x 1¼ x 16½	Wood
2 pc.	¾ x 5	Wood handles
2 pc.	3/16 x 24	Metal rod
15 pc.	2½ x 6	Sheet iron or tin
3 pc.	2½ x 2½	Sheet iron or tin
12 ft.	No. 18	Flexible cord
15 ft.	No. 18	Bell wire
18	No. 4 x ½	Wood screws
19	No. 6 x 1	Machine screws with nuts
1	3.8-volt	Lamp
		Insulated staples
1	Miniature socket (Christmas-tree type)	
1	3-cell Battery (flashlight or C)	
White paper or cardboard for lettering the symbols		

Build up the board with frame and finish in stain or paint as described. The tin plates should be bent as shown, and 5/32-in. holes should be drilled or punched about ⅜ in. from each end. Place the plates on the board as shown. Use a flat-headed screw at one end of each plate, and a No. 6 machine screw at the other. The screws are marked with a cross (x) and the bolts with a circle (o) in the illustration. This will hold plate firmly and serve as contact for the wiring at the back, so that no wire need pass through the board. The metal pointers, when not in use, may be placed in the holes bored for this purpose in the two ends. The back may be covered with cardboard from an old carton. This is not necessary but produces a more finished job.

When using the board for class drill, hang it in a prominent place within easy reach but high enough so that all can see. Then call up two students. One takes the left-hand pointer and holds it upon any symbol in the left-hand column. The other student must point out two other symbols in the first column which have the same meaning as the one called for, and must also find one rule in each of the other columns which would obtain that symbol for an answer. Thus, there will be five correct responses and five flashes of the signal lamp for each symbol called for, or fifteen correct answers if all three cases are pointed out by the questioner. Many variations may be used, such as choosing teams, timing the responses, scoring for correct answers, and the like. Of course, a drill of this kind is most effective if used sparingly, for a few lessons when Ohm's Law is first taught and then sometime later for a review. Later in the course, when the power law is taught, cards may be made for "power," "watts," and "W," and the rules for obtaining the units involved. These cards may be placed in the proper places and the board used equally well for drill on the power law.



RIVETING AIDS

Joseph J. Lukowitz,
Milwaukee, Wisconsin

Unless suitable means of support is provided for work to be riveted, the process of riveting is sure to cause trouble.

A riveting stake similar to that shown at A in Figure 1, will take care of most of the riveting requirements likely to be encountered in the school shop. These stakes may be made in the shop or purchased. A feature of the stake shown at A is the rivet seat located on the angle at the curve. This feature will be found very useful for work requiring more clearance than is provided by using the rivet seat located on the horizontal section of the stake. The stake, of course, must be held in the vise when in use.

The other riveting aid, shown at B, is especially useful in a great many riveting jobs, two of which are illustrated at C and D. The simple device shown at B will support certain jobs even more solidly than a stake. It also is very useful in supporting work while it is being center punched. It may also be used in bending light material to required curves.

Cut the ends of the mandrel as shown, about ⅜ in. in from the ends and about ¼ in. deep.

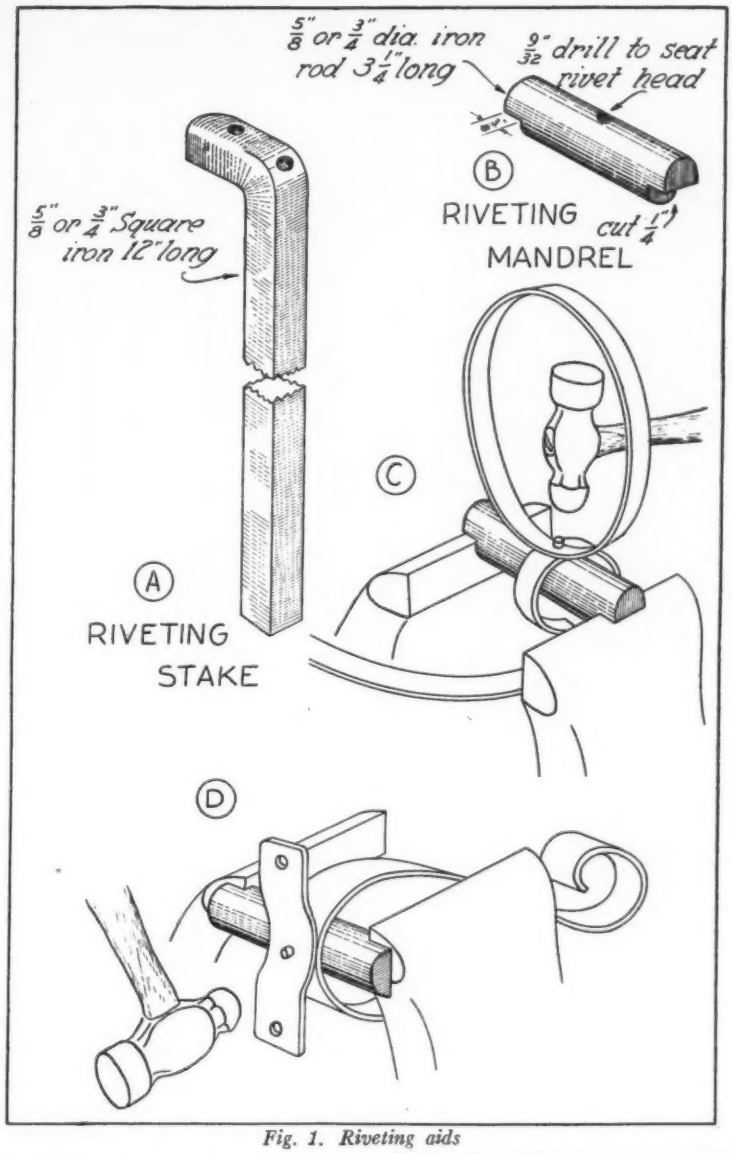


Fig. 1. Riveting aids

Either tool steel or mild steel may be used for making either the mandrel or the stake. Tool steel, of course, will be the more preferable.

CLAMP FOR ASSEMBLING T SQUARES

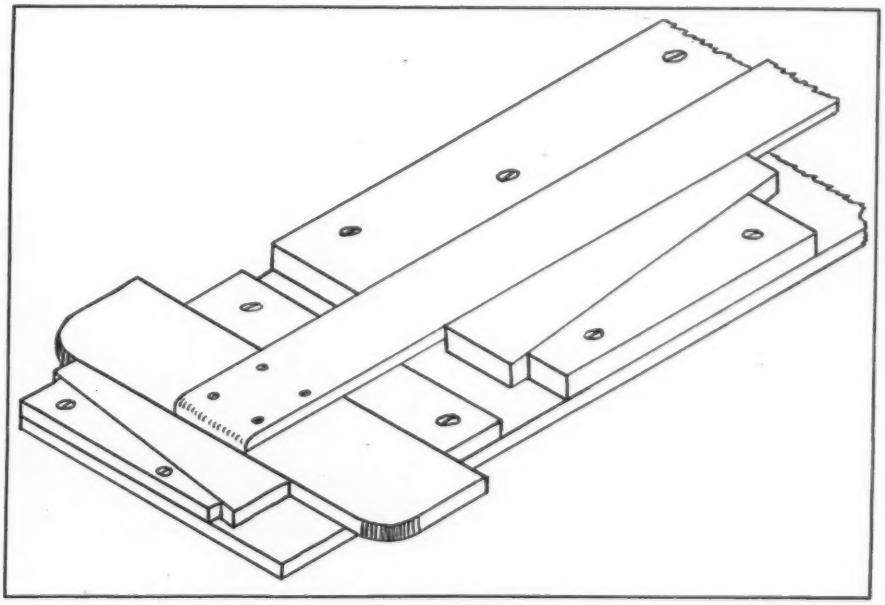
Leonard Wahlstrom, Francis W. Parker School, Chicago, Illinois

The clamp illustrated herewith was devised when a special group of boys, who were making a study of the various types of engineering, made a small mechanical-drawing outfit which could easily be carried from school to home for work assigned.

This clamp proved very successful in assembling the T squares. It also has been found very useful in repairing T squares for the mechanical-drawing class. It happens frequently that boys drop their T squares with the result that the head of the square is usually loosened.

With this clamp it is a simple matter for a boy to remove the screws, scrape the glue, drill new holes for the screws, reglue the head and place in the clamp, and then set the screws in the new holes. When dry, he again has a rigid square, practically as good as new.

The clamp is simple to make so that any boy may be given the job to make one as an additional piece of equipment for the drafting room. Skill in planing the stationary pieces and placing them at right angles to each other are the only requisites. The offset braces should, of course, be placed so that the wedges will slide parallel to the parts of the T square. Dimensions are omitted as the size of the T square will determine the size of the parts.



T-square clamp

TEACHING THE LAY OF THE CASE IN JUNIOR HIGH SCHOOLS

Frank DiGiacomo, Stuart Junior High School, Washington, D. C.

There are various methods of teaching the lay of the case in school printshops. Each method has its advantages and disadvantages. In one method, the boys are required to draw a diagram of the case and then copy the letters in from a key chart; in another, they are required to set out all the letters in the case and stand them up in the boxes; in a third, they are given a printed chart and started off by setting full lines of type. It is the opinion of the writer, from experience in teaching printing in the junior high school, that the first method offers no educational values; while the other methods, though permissible for senior-high-school boys, contain so many learning elements that they should be taught separately to the junior-high-school student.

In the exploratory course offered at the Stuart Junior High School, the boys are first given a blank chart printed on newsprint, which they proceed to fill in according to the instruction on the lesson sheet after a demonstration by the instructor. When this chart has been completely filled and approved by the instructor, another chart printed on white cardboard is given to the student with direc-

tions that it be filled out neatly in ink and pasted in the printing notebook. With this clean and correct chart before them, the boys perform operations 4, 5, and 6 indicated on the instruction sheet. The boys ask for a personal test when they feel sure they can locate all the letters in the case. After the test has been successfully passed, the questions are answered in the notebook, and the next assignment is made on the use of the stick.

The writer has found this method highly successful in teaching junior-high-school boys, since it gives them the needed activity without containing too many learning elements in one lesson.

Unit 1 PRINTING Lesson 1

PURPOSE: To learn the lay of the case.

INFORMATION:

Type is kept in shallow wooden cases divided into compartments called boxes. There are three different kinds of type cases on the market: News, Triple, and California Job case which is the most popular for school purposes. This style of case is a combination of two cases, the left side holding the small letters and the right side holding the capital letters; and it holds sufficient type for ordinary purposes.

The lower case boxes in this case vary in size according to the frequency the letters are used and the boxes are so arranged that the letters most used are in the center nearest the compositor. The letter "e" is the most frequently used in the English language and is therefore assigned the largest box. The J and U are out of place because they were not added to the case until 1882.

WHAT YOU ARE TO DO:

1. Take the blank chart of the case and place it before you.
2. Pick up two or three letters from each box, look at them and write the letter in the corresponding box on the chart. Why pick two or three letters? Replace the letters in the same box from which they were taken.
3. Fill in all the boxes on the blank chart in the same way.
4. Locate the following combinations on your chart and point to them in the case with your finger:

b c d e l m n h q v u t G O W ffi
H I K L M N O i s f g o y p w
A H P X X Y Z J U & ffi

5. Spell out the following sentence by placing the index finger in the box which contains the letter. Do not pick up the letter unless you are sure of it. Spell the words to yourself. "The quick red fox jumped over the lazy brown dog."
1 2 3 4 5 6 7 8 9 0, . , - ' : ; ? ! & fi ff ffi fl ffl
6. When you can locate all the letters in the case without the chart ask the instructor for a test.

QUESTIONS:

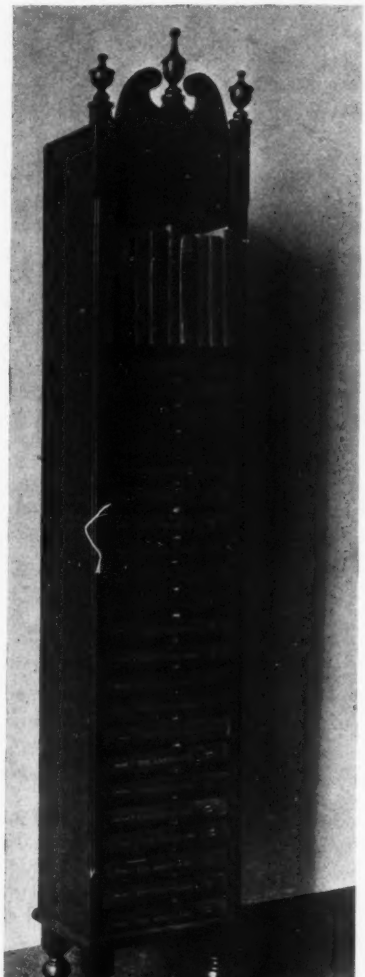
1. Why are the lower-case letters not alphabetically arranged?
2. Why is the California Job case most commonly used in school?
3. What letter is given the largest box and why?

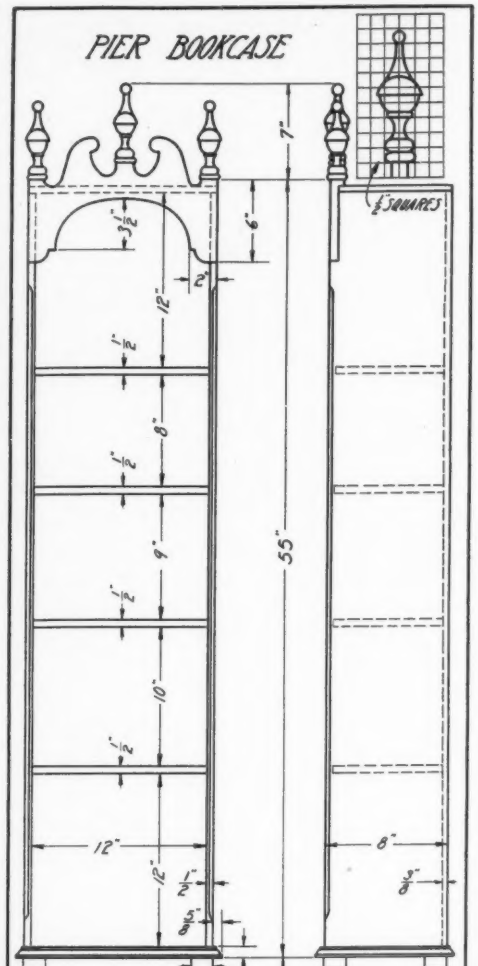
Do not destroy this sheet. Answer questions in your notebook.

PIER BOOKCASE

William H. Mulvey, LaSalle-Peru Township High School, LaSalle, Illinois

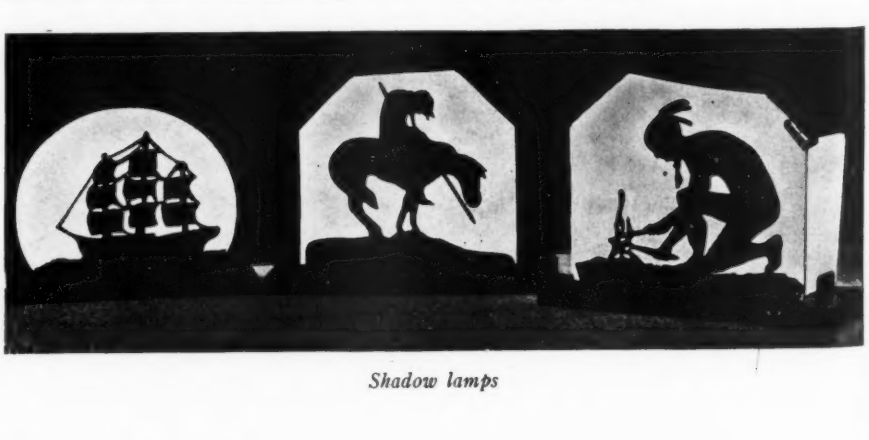
The word "pier," meaning long and narrow, has several applications, the most common, of course, being a landing place for boats. In furniture design, the application may take the form of a tall narrow bookcase, like the one described herewith.





As a problem in the woodshop, the pier bookcase has many values. It lends itself to change of design to meet individual tastes and needs, for example, as a small bookcase for the boy's own room, or as a bookcase to fill that awkward space in the living room. The finish can be varied in the same way. A soft cheap wood lacquered and shaded, or crackled, will add the note of color needed or desired; or a higher grade wood may be used, this being stained and varnished to match other pieces of furniture with the same general success.

The illustration shows an adaptation to serve as a case for a set of encyclopedias. The shelves are spaced to fit this particular set, and the case finished with red lacquer on the inside, while the outside is lacquered in red and crackled in black.



Shadow lamps

SHADOW LAMPS

Ivan Hostetler, South Georgia Teachers College, Collegeboro, Georgia

The shadow lamps herewith described are very practical projects for the general shop because they involve a great many learning units in wood, sheet metal, electricity, glass, and design. These lamps are inexpensive, and they appeal to the students because they present many possibilities for them to express their originality in designing the silhouettes and in the shaping of the glass. By harnessing the heat from the light bulb, moving flames and waves may be produced which make the lamps more realistic and interesting. Since his experiences are so varied in the making of this project, the student will not lose interest. Not only are the students interested, but parents have frequently expressed their admiration for these novel lamps.

Various kinds of sheet metal may be used in making the silhouette. Twenty to 24-gauge copper is preferable, although brass, tin, or galvanized iron may be used. Metal from discarded automobile bodies has been used successfully for this purpose. The latter two metals should be lacquered or bronzed the desired color.

The pattern for the silhouette (see Figs. 1 and 2) is transferred to the copper by means of carbon paper, or by cutting the pattern out of paper and gluing it to the metal. The design is then cut out with the tinsnips and the jeweler's saw. Any rough edges should first be filed and then smoothed with steel wool. If a high polish is desired, polish the copper on the buffing wheel, after which apply a coat of wax or lacquer to keep it from tarnishing. A mat finish is produced by polishing with fine steel wool. From ½ to 1 in. of metal at the bottom of the silhouette is bent back to an angle of 90 deg. where it is fastened to the wooden base.

The base may be made out of any kind of wood, preferably walnut or gum. It should be approximately 1 by 4 by 12 in. The edges may be chamfered, or where a shaper is available. other designs may be used.

The glass may be secured from any automobile wrecking grounds and cut to the desired shape and size. The sharp edges may be ground and the two faces of the glass frosted by the use of carborundum powder and water. This may be accomplished readily by laying the glass on a flat surface, applying a thin paste of No. 180 carborundum powder, and with a flat stone (an old whetstone or emery stone) in your hand, rubbing the paste on the glass with a rotating motion. Continue this operation until the glass is thoroughly frosted. The side wings should be frosted in the same manner.

Beautiful lighting effects may be produced by using different colored lamps back of the silhouette, or by painting a plain lamp the desired color or colors. However, the most pleasing effect for the Indian silhouette is the moving flame. This motion is produced from the heat generated by the 25-watt lamp. The heat passes through a series of fins in a 3-in. tin disk which forms the top of a celluloid cylinder, Figure 3. Fine spiral stripes are painted on the cylinder, so that as it revolves it gives the flame an upward movement. A very

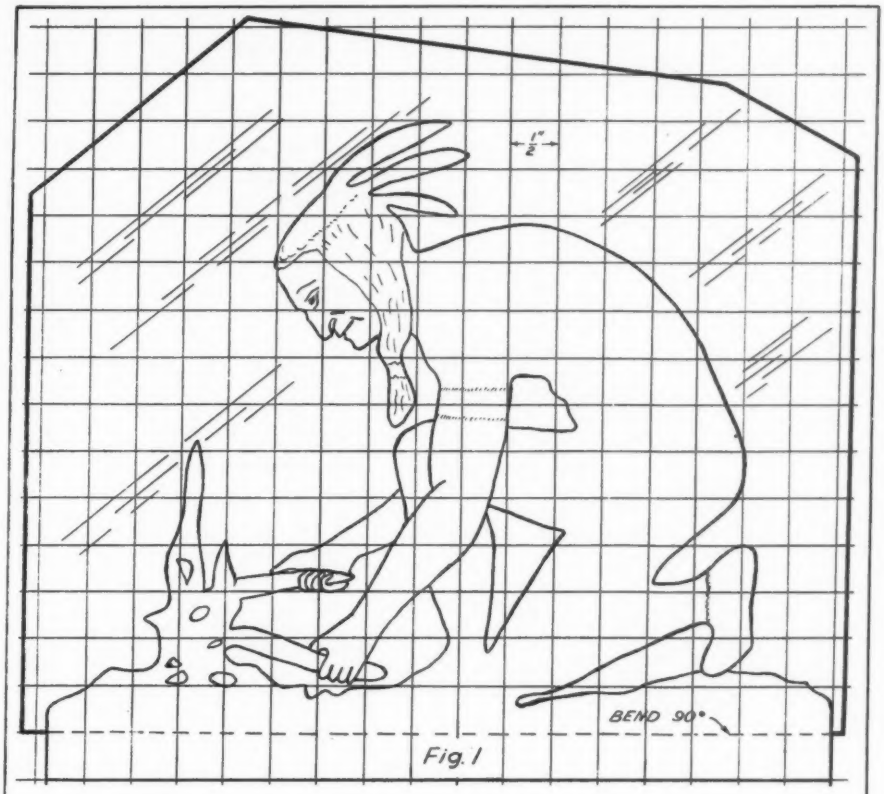


Fig. 1

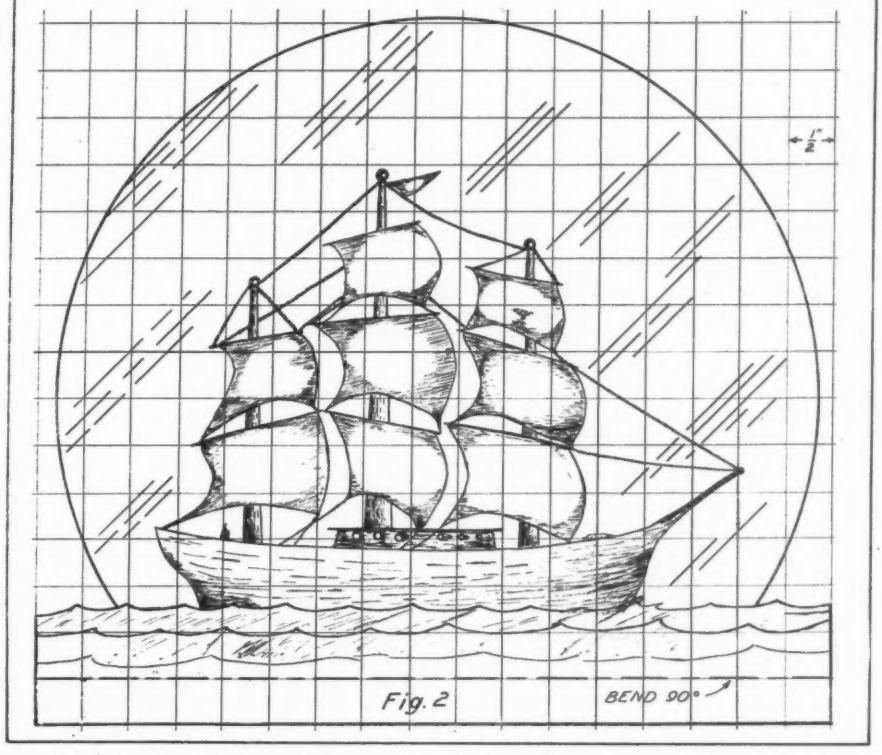


Fig. 2

satisfactory bearing for the cylinder may be made from the tip of a discarded Christmas-tree light bulb. This may be fastened to the tin with liquid solder, as shown in Figure 3. The pivot on which the cylinder revolves should be made out of soft wire (stovepipe wire will do) which must be fastened securely to the light bulb. The cylinder must be perfectly balanced so that it will not touch the light bulb or the tin guard around it. The two ends of the celluloid used in making the cylinder should overlap about ⅛ in. and be fastened together either with thin wire staples or with acetone.

The shadow lamp gives the general-shop teacher an opportunity to teach many *know*

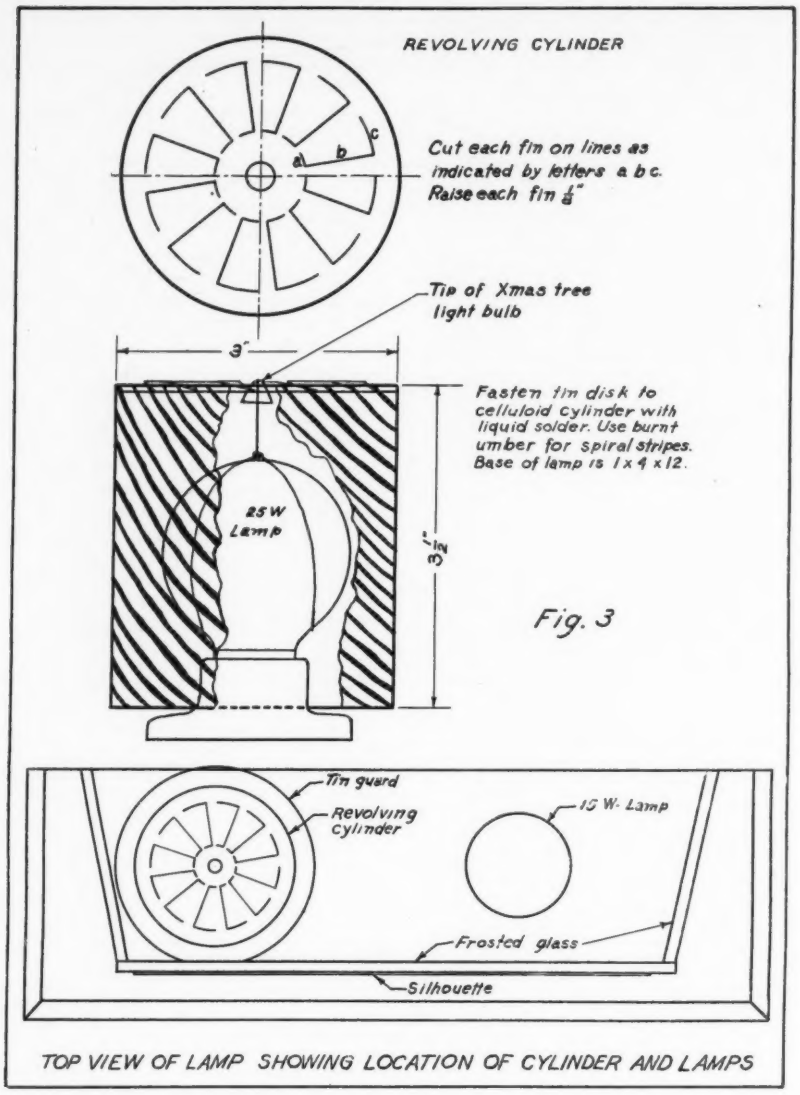

REVOLVING CYLINDER
Cut each fin on lines as indicated by letters a b c.
Raise each fin 1/8"
a
b
c
Tip of Xmas tree light bulb
3"
Fasten tin disk to celluloid cylinder with liquid solder. Use burnt umber for spiral stripes. Base of lamp is 1 x 4 x 12.
25 W Lamp
3½"
Fig. 3
Tin guard
Revolving Cylinder
15 W. Lamp
Frosted glass
Silhouette
TOP VIEW OF LAMP SHOWING LOCATION OF CYLINDER AND LAMPS

Fig. 3. Revolving cylinder for shadow lamp

and *do* units relative to sheet metal, wood, glass, electricity, and design. He has an opportunity to teach a wealth of related information about these materials. It is a real live project, involves many materials and processes, is inexpensive, offers many opportunities for the student to express his ideas and his originality, and it holds his enduring interest.

AN A.C. RADIO ASSEMBLY

I. G. Terry and W. A. Dickinson, Senior High School, Marshalltown, Iowa

For some time we have been searching for a shop project which would embody many of the elementary principles of electricity, foster skill and careful workmanship, and at the same time captivate the student's interest and enthusiasm. At last we have hit upon such a project in a simple a.c. radio assembly. The assembly includes practice work in radio circuit design, application of rectifiers, assembling condensers and resistors in constructing filters, all in one compact arrangement. Furthermore, the cost of the materials is not prohibitive for the typical high-school student; and in this day of a.c. radio operation, the project proves to be interesting in exemplifying the essential principles employed in a.c.-set operation.

The assembling and wiring of a simple radio circuit is a splendid method of introducing to the student the more complex radio and electrical circuits. Also, in constructing the tuning coils, he learns his first lesson in matching coils and condensers to produce resonance. The rectifier presents to him quite vividly the essential principles involved in converting a.c. current to d.c. current, while the filter system clears up the principles of hum attenuation.

Radio Circuit

The panel may be drilled according to the panel-layout plan, shown in Figure 1, with two holes for the two dial shafts, one for the condenser, and one for the shaft of the regeneration control. If the regeneration control has a switch attached, these are the only controls needed. If not, another hole must be drilled for the main switch.

The arrangement of the parts on the baseboard is shown in Figure 2. The socket connections to the tubes here are marked and shown looking down from above. Since sockets bought on the market are not always marked, a tube chart may prove helpful in obtaining the correct socket connections.

The circuit is of the regenerative type. The 3-circuit coil may be constructed in the shop according to the specifications suggested in the coil assembly shown in Figure 3, or, experimental coils may be made. Making experimental coils may prove very beneficial in acquainting students with the effect that the number of turns, wire size, spacing of coils, diameters of coils, have upon the performance and frequency range of the receiver. It may prove very interesting and instructive to experiment with short-wave coils, substituting these coils in the place of L_1 L_2 L_3. Students should do much experimenting with winding these coils, as the spacing of the primary and secondary makes considerable difference in the results obtained. Also, the number of turns on the plate coil will materially affect the operation of the receiver. Generally speaking, if the receiver will not regenerate enough, it is an indication that the plate coil has not enough turns, or that the coupling between the plate and tuning coils is too loose. If the receiver oscillates too much, an additional resistance added in series with R_1 will remedy this.

Practically all the other parts of the circuit will need to be purchased and assembled according to the diagram.

Rectifier and Filter Assembly

The a.c. current must be rectified and filtered before it can be of use in the receiver. A *25Z5* rectifier tube (the heater of which is connected in series with that of the 76) is a very simple and economical means of obtaining rectification.

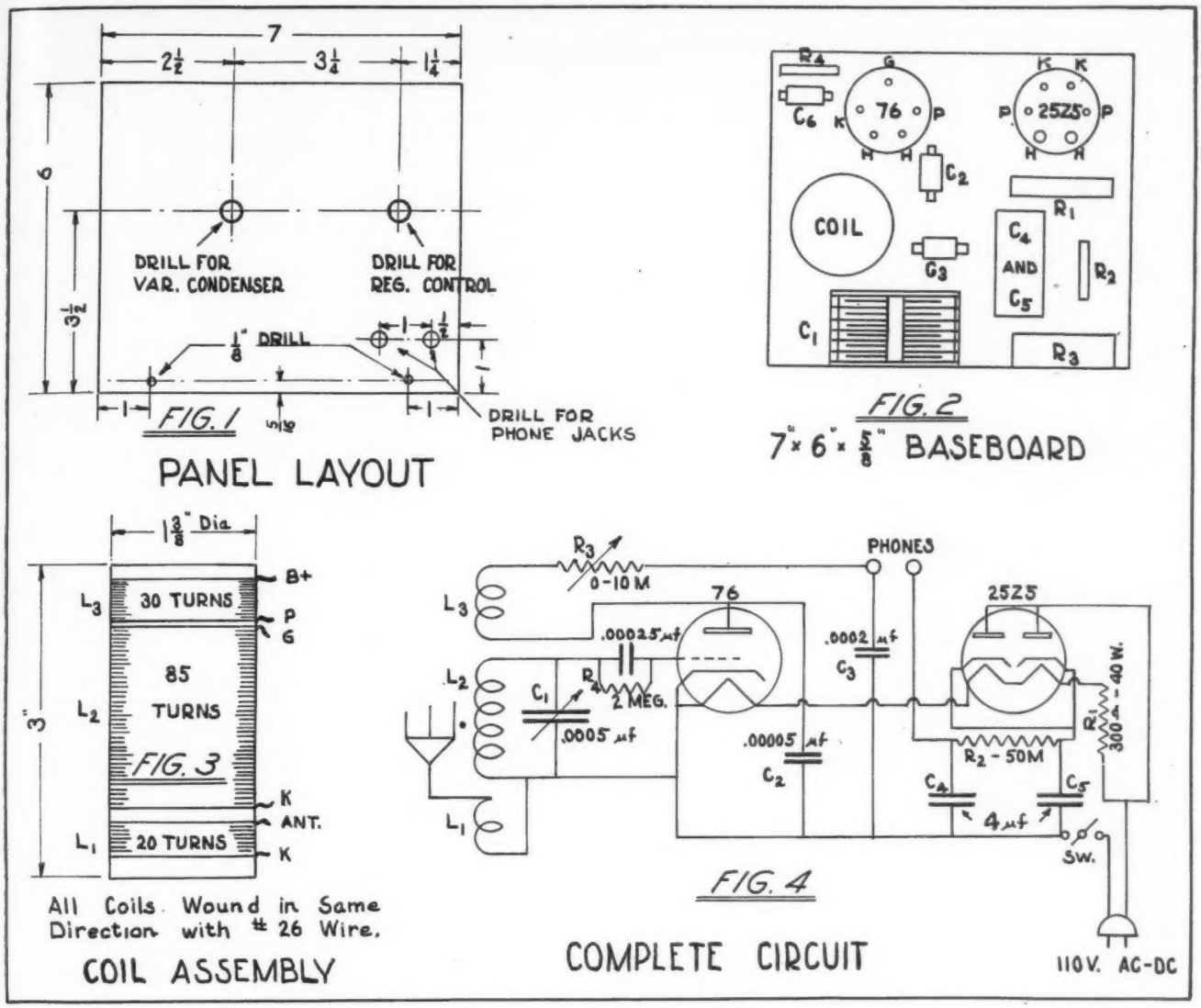
A simple resistance-capacity filter gives very satisfactory results for this receiver, as the 500,000-ohm resistor acts to reduce the plate voltage of the 76 tube to the correct value, and at the same time attenuates the d.c. ripple to a point where the hum from the ripple can no longer be heard in the headphones. Thus, this resistor is used to accomplish two things at one time. The by-pass part of the filter is composed of two 4-mfd. electrolytic condensers.

Complete Assembly

To connect the set to the 110-volt supply, either an ordinary 10-ft. cord or a 300-ohm resistance cord may be used. If the resistance cord is chosen, its resistance element takes the place of resistor R_1 shown in the diagram of connections, Figure 4.

Now, an antenna of any desired type may be erected, and the student has at his command a complete a.c. radio which is capable of receiving an average-powered broadcasting station within a radius of two or three hundred miles.

As a final note of precaution, it might be mentioned that under no circumstances should an external ground be used with this receiver, as one side of the power line is already grounded.



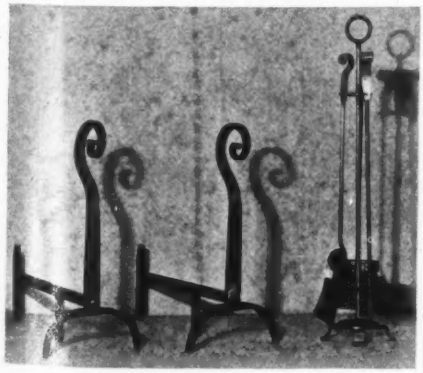
A.C. radio details and assembly

FIREPLACE SET

H. M. Andersen, Morton High School, Cicero, Illinois

Under the method of construction given here, this problem may be undertaken by the first-semester students in general metal.

The stock selected for the uprights of the andirons is ⅜ by 1½ in. The length is determined by the height of the fireplace. The desired taper is scribed on these pieces and cut in the machine shop. The material is then forged to the chosen taper and thickness, and the scroll is formed over the template. The scroll is offset to the back to give balance. The uprights are attached to the foot by a mortise-and-tenon joint. The foot may be shaped as in the illustration or to any other desirable shape chosen.



Fireplace set

The arms for supporting the fire are ½ by 1 in. These are turned on one end and riveted to the upright. The rear supports are oxy-acetylene welded in both cases.

The stand for the tools is made ½ in. round and threaded into the base. The base is a disk 4 in. in diameter with cross members riveted to it for feet. The tools have shafts ⅜ in. round, threaded into the grips. The grips are made of ½ by 1 in. machined to a taper ½ in. square at one end and forged and scrolled at the other similar to the andirons. The brush is made of a painter's dusting brush with the handle cut off and fitted into a metal cup.

The entire set is finished by rubbing down thoroughly with emery cloth.

COPPER AND WOOD BOOK ENDS

Roy T. Puckey, The Pingry School, Elizabeth, New Jersey

1. Cut the wood for the two uprights to the required dimensions. Sandpaper carefully, stain and fill. Apply at least two coats of shellac thinned with alcohol.

2. Cut tagboard templates for the different parts of the boat. Transfer these patterns to 24-gauge soft copper with a scriber. Cut out the shapes with tin snips.

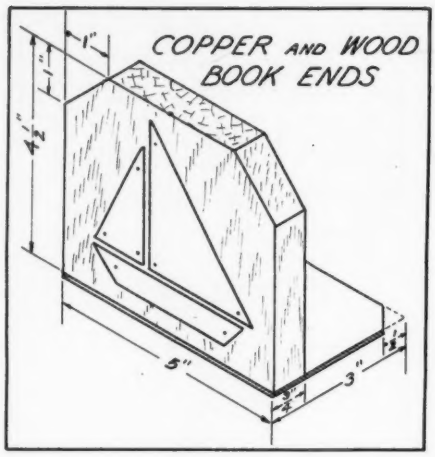
3. Drill the holes in the boat pieces for the escutcheon pins. Polish the pieces with fine steel wool, and place them in position on the wood and fasten in place with brass escutcheon pins.

4. Cut the bottom pieces out of 18-gauge copper. Locate two holes for 2 No. 5 by 1-in.

f.h. brass screws to fasten the bottom piece to the wood block. Countersink the holes so that the heads are flush with the underside.

5. Polish the bottom pieces with fine steel wool and fasten them to the wood blocks.

6. Finish the book ends by applying one coat of clear lacquer to all surfaces.



BELT CLIP

William J. Becker, Boynton Junior High School, Ithaca, New York

Have you a knife, keys, or similar articles that are easily lost? If you are a boy scout, most likely you carry these things, or perhaps a whistle. The sketch shows the number 65 chased in the center, but in your design, you may put any number there, provided, of course, that such a design is practical to chase.

Materials Required

1 piece of 18-gauge copper, ¾ by 4 in.

1 cotter pin, ⅛ by 1¾ in.

Directions

1. Make a design of the belt clip, using squared paper for this purpose. Design need be only that going on front of hook. Figure 1 shows but one design possible.

2. Have instructor check design, then cut metal for job.

3. Scribe outline of pattern on copper.

4. Trim off ends and file to shape. (See instructor for fine files.)

5. With the scriber, draw the bending A, B, C, D, and E, lines shown in Figure 2.

6. Transfer the design to the front of project.

7. Ask instructor for peen punch. Clamp the job to a stake with a flat surface and peen, using tool and medium-weight machinist's hammer. See design in Figure 1.

8. Keep work clamped on stake; chase portion of design to be chased. See Figure 3. Have instructor show you this operation; also, before chasing, practice on scrap metal and check results with instructor.

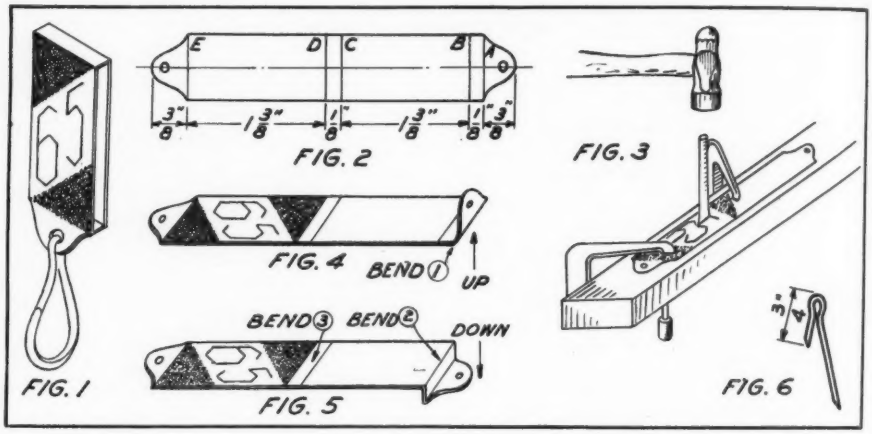
9. Lay out holes, 3/16 in. from each end as shown in Figure 2 and center punch. Drill with a 3/16-in. drill.

10. Make bends *carefully* as described and illustrated.

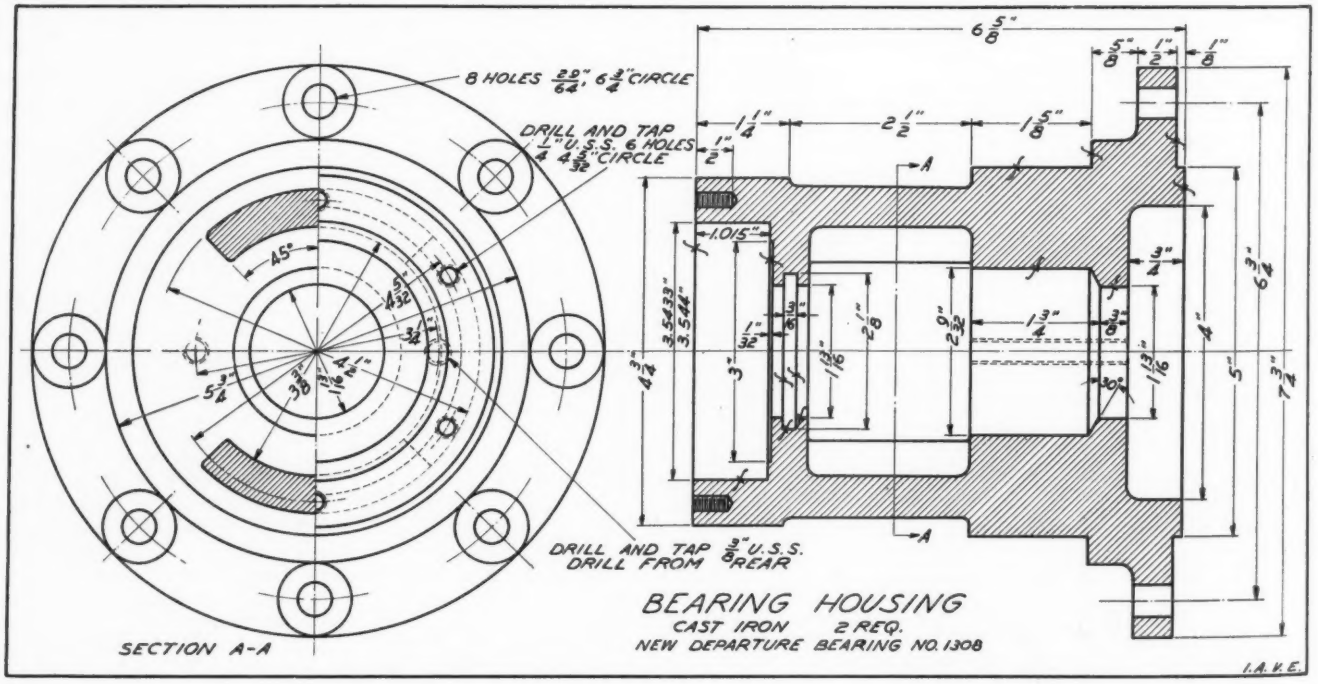
a) Bend (1), Figure 4. Perform by clamping to stake and making right-angle bend.

b) Bend (2). Clamp flat to stake with bar of metal clamped above it. Bend down to shape by holding a piece of ¾ by ⅛-in. wrought iron against bend and hammer *carefully* to shape. See Figure 5.

c) Bend (3). Make bend by clamping a



Belt-clip details



Detail of bearing housing for the hydraulic absorption dynamometer described on page 286, September, 1936, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

piece of ⅛ by 1-in. wrought iron in place and bend around it. Make sure that holes come together.

11. Get a ⅛ by 1¼-in. cotter pin from the instructor. Cut short end off ¾ in. from top. See Figure 6.

12. File the ends as shown in Figure 6 so that they will meet flush.

13. Place key in clip.

14. Bend key round, using small needlenose pliers; also try small stake. Ends must meet as in Figure 1.

15. Clean job well with steel wool. Avoid smudging with fingerprints.

16. If job is to be polished, use buffer. If it is to be colored, immerse in liver-of-sulphur solution until it is black.

17. Rinse with water and blot dry (or dry in sawdust barrel).

18. Polish lightly with damp cloth on which pumice stone has been dusted. Rub off black so that copper shows in spots.

19. Rewash and dry.

20. Finish with clear lacquer to preserve finish.

References

A. Shop display board.

B. *School and Home Shopwork,* Schultz and Schultz, Allyn and Bacon, New York City.

C. *Metal Work,* Jones, Bruce Publishing Co., Milwaukee, Wis.

D. *Essentials of Metal Working,* Berg and Wing, Manual Arts Press, Peoria, Ill.

E. *Art Metal Work,* Payne, Manual Arts Press, Peoria, Ill.

Questions

1. Give the common method for transporting copper from Duluth to Cleveland.

2. Bronze was used by the ancients. How did they make it? Reference B, page 193.

3. Discuss briefly the uses of copper. Reference C, page 54.

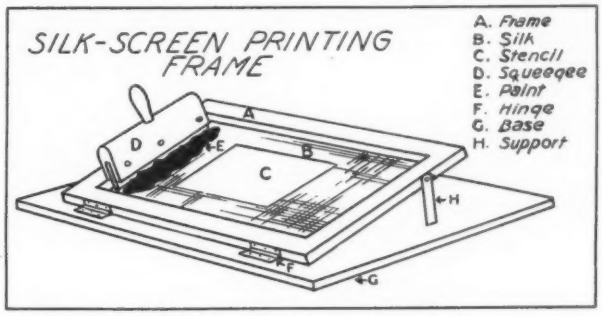
4. Give three facts in regard to nickel. Reference D, page 72.

5. Give some advantages that art metalwork as a *craft* possesses that other crafts lack. Reference E, page 10.

SILK-SCREEN PRINTING

E. J. Busenbark and J. I. Biegeleisen, New York City

The development of silk-screen stencil printing has been quite unusual, one might say almost romantic. Of course, the ordinary stencil-printing method has been in use for several hundred years, but being a rather crude, primitive process, its use has been confined mostly to wall decoration, and for printing instructions on shipping cases, and the like, where a fine quality of work is not required. However, a little more than twenty years ago it was learned that by attaching paper or other stencils to silk bolting cloth, the *center* or *island* parts of the stencils could be permanently held in their proper position without the use of *ties* or *bridges*.



This simple elimination of the ties completely revolutionized stencil printing by greatly improving the quality of the work, increasing the range of the process, and making quantity production possible at low cost. Today a whole industry has grown up, specializing in this type of printing. In addition, it is extensively used by chain and department stores for printing posters and window stickers, and by manufacturers of a great variety of products, such as textiles, wallpaper, furniture, machinery, greeting cards, lamp shades, bottles, household glassware, and novelties of many kinds. The process has been called the most versatile printing method ever devised, as it works equally well on cardboard, wood, paper, cloth, felt, leather, metal or glass, and with either oil or tempera paints, enamels, lacquers, or dyes.

It is ideally suited for classroom work, being adaptable to both the fine and applied arts, and is splendid for both vocational and avocational use. Since it is a quick and simple method, students are able to see the results of their efforts before they lose interest in their work. Inasmuch as the commercial field is not overcrowded, skilled workers of this new craft have less difficulty in finding employment than workers in many other fields. Amateur artists find it an inexpensive and highly interesting method of artistic expression in their leisure hours. Aside from the work now being done in schools of a purely industrial nature, students are finding the screen process a convenient way to print posters and announcements for school activities, for printing greeting cards, wall panels, book and magazine covers, serving trays, and numerous other articles of utility or artistic value for household use.

Owing to the great variety of ways in which the process is used, it is impossible to describe here all of the materials and methods employed. However, for general school purposes, the only special equipment required is a wooden printing frame to which the silk is tightly stretched and tacked; a rubber blade or squeegee to force the paint through the silk, and a firm, flat-topped table or board to which the frame is attached with hinges. The accompanying illustrations were made with homemade equipment, the total cost of which

FOR YOUR BULLETIN BOARD

POSTER 81 **JANUARY, 1937**

RESOURCEFULNESS

No two situations are the same. There are times when tasks must be accomplished with limited working material. Resourcefulness must be developed that one may accomplish his purpose under adverse conditions and often under distinct handicaps.

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Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York

was less than $2. Once the initial equipment is acquired, it may be used over and over again. The printing frame is made of 1 by 1½-in. kiln-dried wood, free from knots or warpage. The inside dimensions of the frame are 14 by 20 in. This is large enough to make an 11 by 14-in. print, leaving enough space at the sides for the squeegee to move back and forth freely, and also to allow sufficient space at each end of the frame for the paint supply.

Many kinds of stencils have been used at various times, but the ones now most generally employed are the glue or cut-in stencil, the tusche stencil, the paper stencil, the film stencil, and the photographic stencil.

The outline drawing, and the drawing of the swans, were reproduced from tusche stencils. In this case the artist first prepared a pencil sketch which was then placed under the screen, and the design was painted directly on the silk with tusche, using the pencil sketch underneath as a guide. When the designs were fully drawn in, glue was scraped over the silk, then the tusche was removed with turpentine, leaving the glue in the silk to prevent paint from flowing through where it was not wanted. The glue, therefore, formed the stencil. Except that it contains turpentine and is thus slightly greasy, tusche resembles artist's waterproof drawing ink and is used in exactly the same way.

The next step was to pour paint on the screen near one end of the frame and force it through the silk by passing the squeegee back and forth. The paint thus forced through was deposited on the printing surface which had been placed in position under the stencil previously.

It will be observed that both of the prints from the outline drawing were made from the same stencil, one of them being printed with black paint on white paper, the other being printed with white paint on black paper. Readers who make prints of this kind from wood or linoleum blocks, will find the screen process superior in many ways. Thin lines do not break down as they are inclined to on linoleum blocks. While it is difficult to make clear, fine, black lines on woodcuts with the screen process, black lines on white are as easy to make as white lines on black. No borders are necessary to prevent smudges in the large

white areas; the colors print more evenly; registration of colors is very much easier; and the time required to prepare the stencil is, in most cases, but a fraction of the time required for cutting a wood block. In this particular

drawing, the outline work was completely pa'nted in with tusche in less than fifteen minutes, and within another thirty minutes, the stencil was ready for printing.

Being a new subject in the field of education, the great possibilities of the process have not as yet been exploited fully by vocational schools, but the success of the classes already in operation assures a permanent niche for screen printing in vocational training.

THE OBJECT-TURNING TABLE

Emil E. Shattow, Lane Technical High School, Chicago, Illinois

The object-turning table illustrated and described herewith, was designed with the idea of making it easier for the student to acquire greater skill in drawing.

The table is used as an effective means for demonstrating the various positions of an object as they would actually appear, if it were tilted at any desired angle, for drawing the three basic views of the object. The property of certain members of the table to revolve about its vertical and horizontal axis enables

FOR YOUR BULLETIN BOARD

POSTER 82 **JANUARY, 1937**

SINCERITY

A man must be sincere in thoughts, actions, and words if he wishes to stand high in the eyes of his fellow men.

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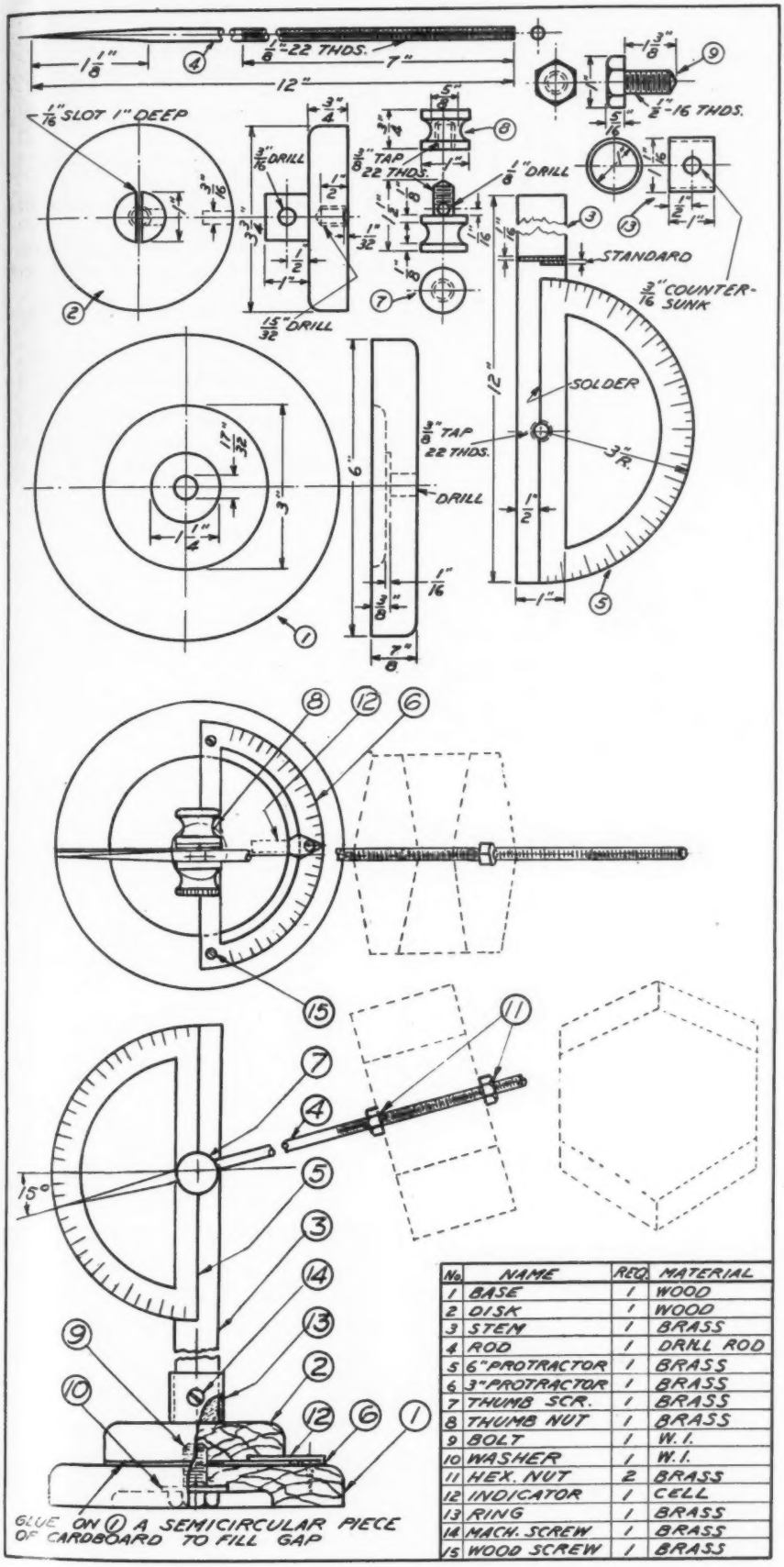
Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York



No.	NAME	REQ.	MATERIAL
1	BASE	1	WOOD
2	DISK	1	WOOD
3	STEM	1	BRASS
4	ROD	1	DRILL ROD
5	6" PROTRACTOR	1	BRASS
6	3" PROTRACTOR	1	BRASS
7	THUMB SCR.	1	BRASS
8	THUMB NUT	1	BRASS
9	BOLT	1	W. I.
10	WASHER	1	W. I.
11	HEX. NUT	2	BRASS
12	INDICATOR	1	CELL
13	RING	1	BRASS
14	MACH. SCREW	1	BRASS
15	WOOD SCREW	1	BRASS

one to demonstrate precisely the positions of the basic views, by means of two protractors mounted on the device, within one degree of accuracy, with little manipulation.

The device is to assist both the student and the instructor; the pupils gain a greater perception in their work, which otherwise would require more imagination than the average pupil possesses, and the teacher gains an aid which helps him give his students a better preparation for their advanced work.

The turning table may be easily and economically built by the instructor himself, although it affords a fine project for some boy of superior ability to work on under the instructor's supervision.

The instrument is very simple in construction and its operation is so obvious from the assembly drawing that it hardly requires a description of its functioning. The assembly drawing depicts, in dots, the outline of a regular hexagonal prism revolved to 15 deg. above the horizontal plane.

To prevent the device from tipping and to permit easy alignment with the straight edge of the desk or table upon which it is placed. it is best to mount and fasten it to a 12 by 12-in. piece of thick cardboard.

FORD-MAGNET TOY MOTOR

S. O. Werner, State Teachers College, Santa Barbara, California

The Ford-magnet toy motor illustrated herewith, has proved a very satisfactory project in the electrical-construction classes at Santa Barbara State Teachers College, California.

This motor is comparatively easy to make, costs only a few cents, and will operate on one dry cell. In addition, the motor, being of the magneto type having a permanent magnet in place of a wound field, is somewhat simpler than the usual series-wound motor and explanations concerning its operation carry over very well from the first lessons on permanent magnets in general and that of the "horseshoe magnet" in particular.

To insure a smooth running motor, special care should be taken to see that the shaft passes through the exact center of the commutator.

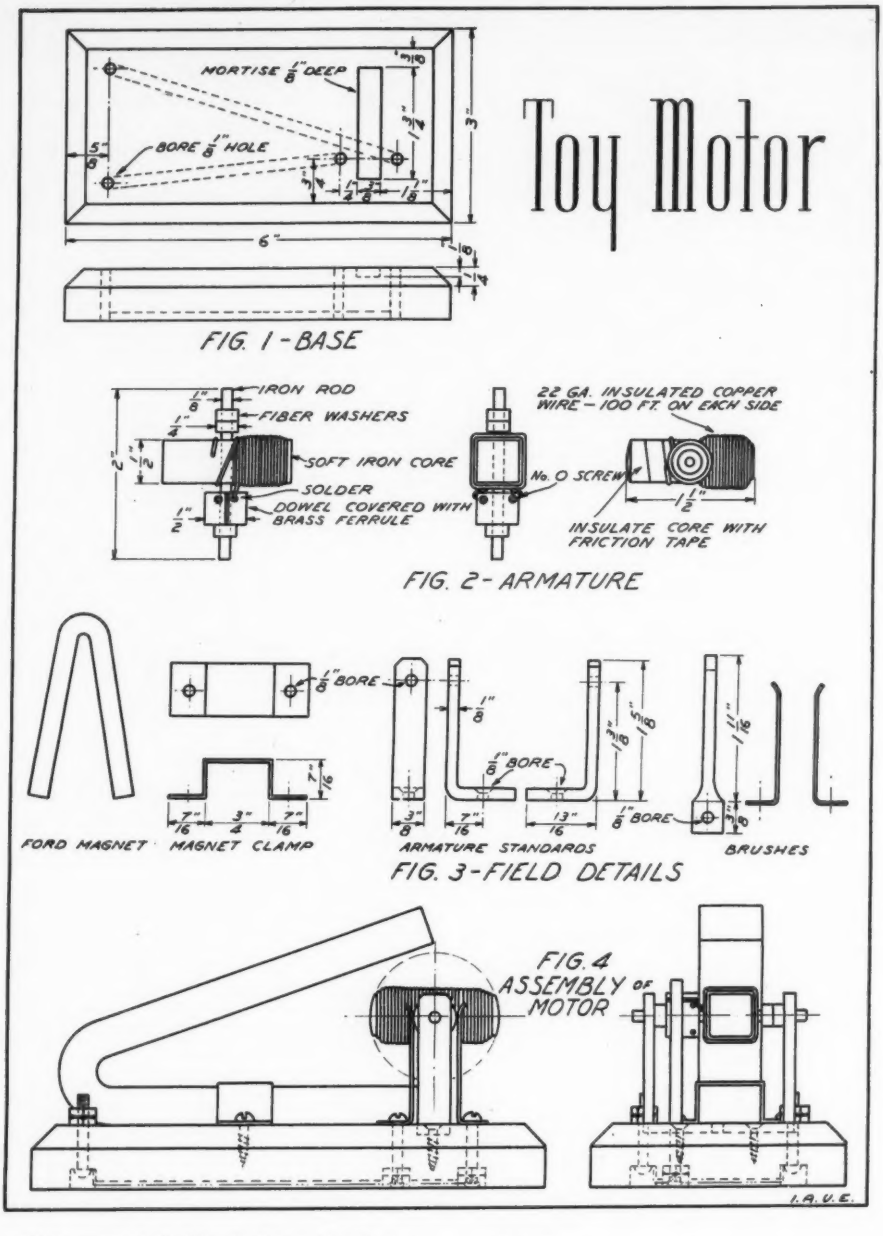
As many shops are not equipped with lathes where centering in the process of turning and drilling is automatically taken care of, a satisfactory method of building the commutator core, when the center hole is already provided, is as follows: Insert the ⅛-in. iron rod (shaft) into a piece of vulcanized fiber tubing having an inside diameter of ⅛ in., an outside diameter of ¼ in., and a length of ½ in.

Press this piece in turn into a tube of the same material ⅜ in. long having an inside diameter of ¼ in. and an outside diameter of ½ in.

Placing the two ends flush, next to the armature, allows the ⅛-in. extension on the smaller tube to take the place of the washer called for between the standard and the commutator.

A snug fit on the shaft makes it possible later to adjust the commutator for either "lead" or "lag." Leave enough slack in the wires leading to the commutator to allow for this adjustment.

Toy Motor



If it seems desirable, the brass ferrule suggested in the bill of materials may be substituted for a piece of ½-in. brass tubing (inside diameter) cut to length and having a 1/32-in. thick wall. An f.h. screw can then be used, the advantage being that when the screw is countersunk the head is flush with the surface of the commutator. Care must, of course, be taken in either case that the screws which hold the commutator bars in place are sufficiently short not to touch the shaft and cause a short circuit.

A No. 16 B. S. gauge phosphor bronze spring wire has been found to be a good substitute for the ⅛-in. phosphor bronze strips used as brushes.

The Base

Materials

1 piece ¾ by 3 by 6 in. sugar pine or mahogany.
2 8—32 by 1¼ in. r.h. brass machine screws.
2 8—32 by ¾ in. r.h. brass machine screws.
6 8—32 hexagon brass nuts.

Procedure

1. Square and plane base to size.
2. Chamfer edges ¼ in.
3. Lay out and mortise for armature standard.
4. Lay out and bore holes ⅛ in.
5. Countersink holes on underside.
6. Gouge channels for wires from terminals to brushes on underside.
7. Finish base with rubbed shellac or varnish or paint.
8. Clean and paint magnet at this time.

The Armature

Materials

1 pc. ½-in. square soft iron ½ in. long.
20 ft. of 22-gauge insulated copper wire.
1 pc. ⅛ by 2½ in. iron rod.
1 pc. ½-in. dowel. ⅜ in. long.
1 ½-in. brass ferrule.
4 No. 0 r.h. brass wood screws.
2 ⅛ by ¼-in. fiber washers.

Procedure

1. Cut core strips and solder together at ends.
2. Bore center hole and insert shaft.
3. Insulate core with tape.
4. Wrap 4 layers of wire, starting from shaft.
5. Bore hole in dowel and attach to shaft.
6. Cut ferrule in half and attach over dowel.
7. Solder one wire end to either half of ferrule.
8. Cut washers and bore holes for shaft.

Field Details

Materials

1 pc. ⅛ by ⅜ by 5-in. hand brass.
1 strip ⅝ by 3 in. 20-gauge brass or copper.
2 strips ⅛ by 2⅛-in. 22-gauge phosphor-bronze.
2 No. 4 by ½-in. r.h. brass wood screws.
1 model T Ford magnet.

Procedure

1. Shape standard to size and bore holes as indicated.
2. Cut standard as shown.
3. Shape brushes and bore holes.
4. Shape magnet clamp to fit and bore holes as indicated.
5. Countersink holes in base of standard.

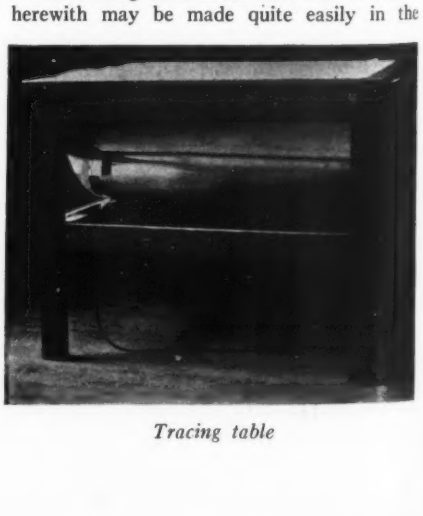
Assembly

1. Place terminal bolts.
2. Bolt brushes in place.
3. Connect with 22-gauge wire, one terminal pole to one brush pole respectively. Solder connections.
4. Screw down one half of armature standard. Place armature shaft through hole. Place second half of standard on shaft and screw down to the base.
5. Fasten magnet in place.
6. Adjust clearance between magnet and armature to 1/16 in. by sliding magnet back or forward.
7. Adjust brush tension to press against commutator.

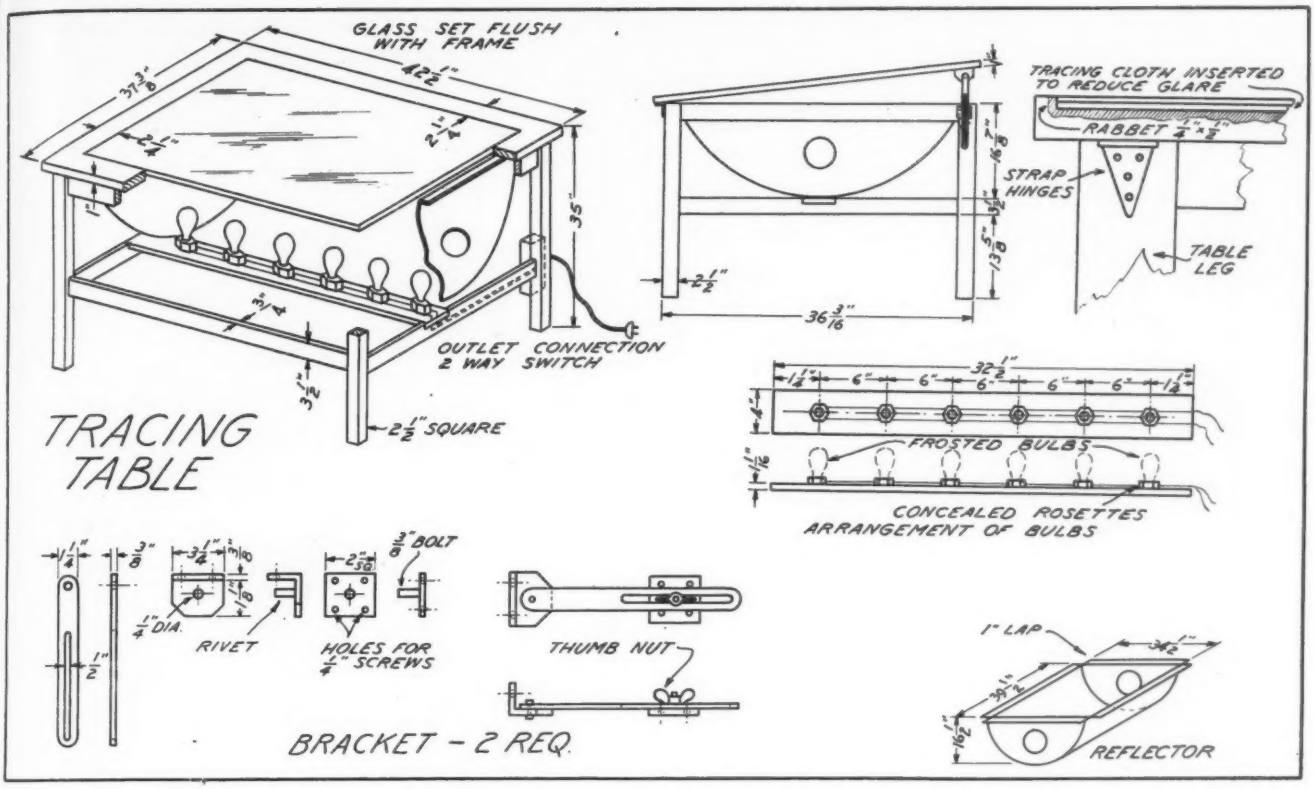
TRACING TABLE

R. E. Murray, Trades Department, Fremont Ross High School, Fremont, Ohio

The tracing table illustrated and described herewith may be made quite easily in the



Tracing table



Details and assembly of tracing table

school shop. Its construction does not involve a large expenditure. It was made 37⅜ by 42½ in. to accommodate drawings of diversified sizes. It is equipped with adjustable brackets which serve three purposes: (1) to insure ventilation; (2) a tilted drawing surface; (3) easy access to the bulbs. The glass is of double strength, two pieces being used to give rigidity. A piece of tracing cloth is placed between the two panes so as to diffuse the light.

The reflector is of tin or galvanized iron. If made of tin, the inside may have to be painted in order to reduce reflection rays. In order to facilitate ventilation, a 3-in. hole must be cut in each of the reflector ends.

For illumination, six 200-watt frosted bulbs may be used arranged into 2 sets, each with a 2-way switch. This arrangement affords two desirable intensities. Higher or lower wattage bulbs also may be used for producing the desired illumination.

The material used in the construction of this table was yellow pine. Other woods would be just as satisfactory.

CLEANSER-CAN COVER

Dale E. Mansperger, High School, Rittman, Ohio

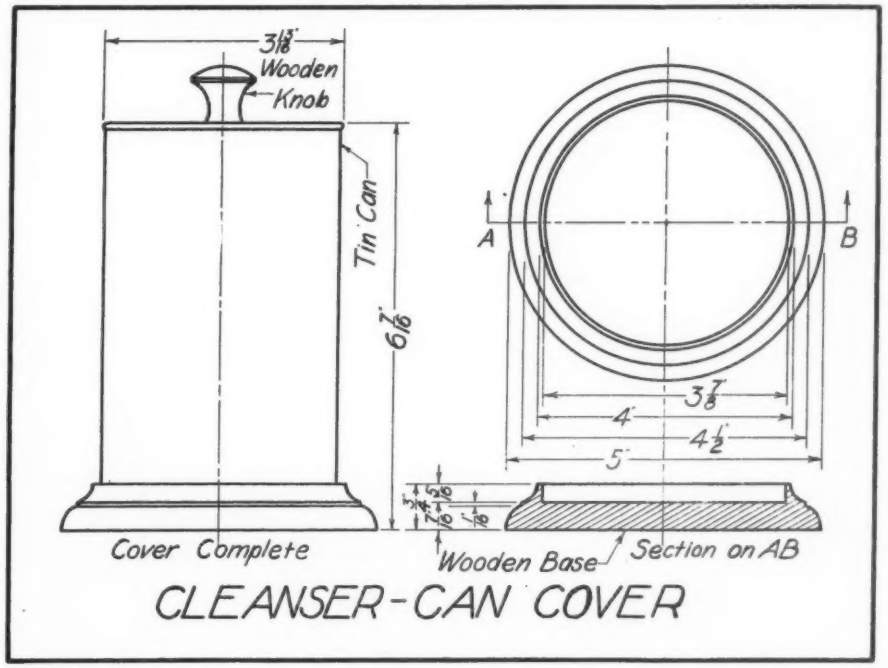
Frequently the housewife wonders just what she shall do with her can of cleansing powder. If she is meticulous about the appearance of her kitchen, she does not wish to leave the can exposed on the sink table. On the other hand, the cleansing powder should be accessible at all times.

The cleanser-can cover has been designed to meet both of these requirements. Through its use, the cleanser can is hidden from view and may well be left in the most accessible place. When the cover is properly made and decorated, it may well enhance the appearance of the kitchen rather than detract from it.

The project has been designed for the woodworking unit of the laboratory of industries. The can which is used for the cover may be obtained from a school cafeteria or from the home. The only machine tool required for making this project is a wood-turning lathe.

Since the design and dimensions are determined by the can cover, it is necessary to make a selection of this part first. Care must be taken so that the can selected is of sufficient size to cover a box of cleansing powder. The dimensions of the base are determined by the diameter of the can.

A piece of wood suitable for the base



INDIAN TEPEE

PLATE BY
W. BEN. HUNT
HALES CORNERS
WISCONSIN

Tepees may be made of 8 or 10 oz. canvas depending on what they are to be used for. If it is to be used for camping, 10 oz. would be best. The dimensions given are for a 10' tepee which will accommodate 4 or 5 boys. If a larger one is wanted, increase the radius and make the smoke opening larger to accommodate more poles. Canvas comes in different widths but the strips are laid as shown and should be double sewed. All edges are hemmed to prevent fraying. Poles should be straight and about 12' long. Peel off the bark and trim off some of the wood from the butt ends to lighten them. Poles should be smooth to prevent tearing the canvas. About 12 poles are required for a 10' tepee. Poles measuring 2" at the butt and 1" at the tip are about right.

When laying out the two edges that are to be laced together, be sure that the door openings and the pin holes are equally spaced on each side

The easiest way to decorate a tepee is to spread it out on a level place. Lay out the designs with a pencil and paint with ordinary house paint thinned down with turpentine. Red, yellow, blue and black are the colors most commonly used.

A ring of 5" or 6" stones about 2' in diameter in the center of the tepee forms the fire place. Do not burn wood with a lot of rosin or pitch as it will soon blacken the inside of the tepee. While a little discoloration from smoke gives the tent a used appearance, too much makes it a messy thing to handle or live in.

By carefully folding, this tepee can be rolled into a bundle 2½' to 3' long by about 10" or 12" in diameter. It should be kept in some sort of bag or covering to prevent wearing at the edges and to keep it clean.

Keep poles in a dry place.

POCKETS

A Tie loop or cord here.

14" 12" 28" 3½"-4" 2' 3" 1'6" 1'

Inner side of door flap

THE DOOR FLAP should be large enough to overlap the door opening by 6" all around and is fastened with loops or tied to the pin directly over the opening.

Pins used to lace tepee are made of ¾" or ⅞" dowels or of any straight ash or willow shoots. They should be trimmed smooth.

THE AWL

Holes for lacing or fastening are made by forcing holes in the canvas with a pointed iron or hardwood awl. By pushing and turning at the same time make an opening about ⅞" and sew around it with a good stout cord by overcasting or by using a buttonhole stitch. (Ask Sis or Mother.) Do not use grommets.

Sew loops around bottom edge for pegs.

1 To erect tepee, tie three poles together and set up as shown. Then carefully place the other poles so they take up as little space as possible where they meet. Tie the tent to a pole at A and —— hoist it in place. Now pull it around and fasten with the pins. (upper right)

2

3 Then go inside and reset the poles so that the canvas is tight. Set the smoke flaps as shown above. Back of tepee should be to the wind. Peg down edge.

Radius of above layout is 10 ft. Smoke flaps extend 12 in.

can usually be obtained from the scrap box in an industrial-arts laboratory. The base should be made of a close-grained wood in order that an attractive enamel finish may be secured easily. The knob may be turned or it may be purchased from a hardware store. It is fastened to the can cover with a small screw.

The cleanser-can cover should be enameled in a color combination which will suit one's taste or which will match the color scheme of the kitchen. An inexpensive transfer applied to the cover will add greatly to the appearance.

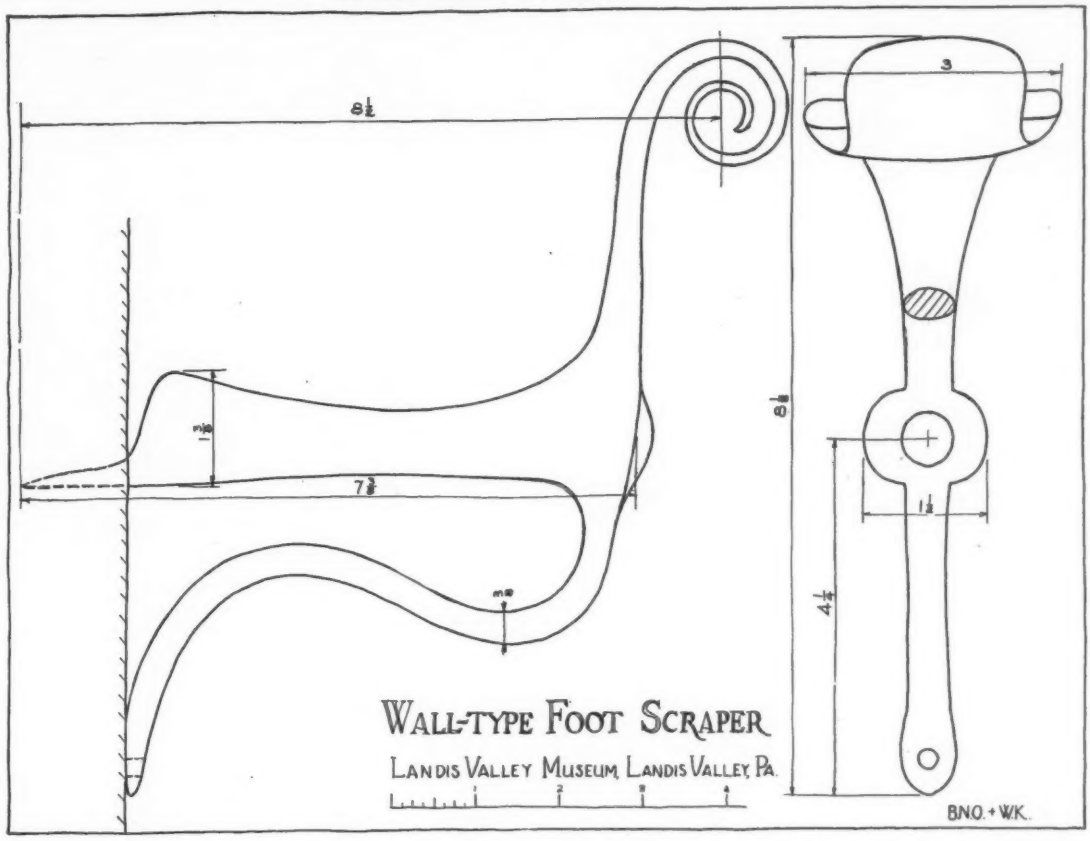
seventeen years of service in that position. Mr. Barker had been engaged in educational service for forty years.

Mr. Barker was graduated from Cornell University in 1886, and shortly after became a draftsman in Chicago. Later he worked for the Allis-Chalmers Company in Milwaukee. He taught manual training in the old East Division High School in Milwaukee, and in 1903 went to Grand Rapids, Mich., where he was made director of manual training under former Superintendent Elson.

Mr. Barker was principal of the East Technical High School, Cleveland, Ohio, from 1908 to 1916. He resigned to become president of Mechanics Institute, Rochester, N. Y.

¶ Dr. Irvin S. Noall, director of trade and industrial education, Salt Lake City, Utah, gave an address before the national convention of the Future Craftsmen of America at the meeting held in Detroit, on November 5. He spoke on the topic, "Responsibil ties of the Industrial-Arts Teacher in the Present Trends of the High School."

¶ Dr. Frederick B. Fisher, of Detroit, Mich., recently delivered an address at the manual arts and industrial-education section luncheon, held at the Hotel Statler in connection with the Michigan Education Association meeting. His talk centered on origins and foundations of industrial arts in building character and culture of a nation as shown in the history of Asiatic peoples. Mr.

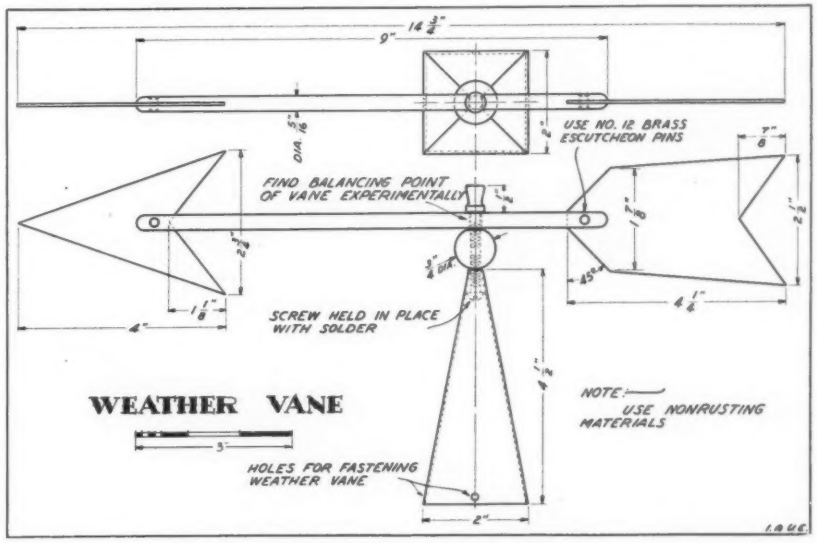


PAGES FROM A MUSEUM SKETCHBOOK

Burl N. Osburn, State Teachers College, Millersville, Pennsylvania

Wall-Type Foot Scraper

This is one of the many ingenious and practical devices of a utilitarian nature, to which the early settlers gave a touch of beauty. Since it is designed to be placed on the side of the building, it is no longer something to stumble over, and, no matter how bad the roads, it never fills up from excessive use. The spike on the blade is driven into the wall, while the other end of the brace is fastened to the wall with a nail or screw. The scroll has been widened and beautifully curved.



Submitted by Henry Conrad, Milwaukee, Wis.

Personal News

MR. BARKER RETIRES

Mr. James F. Barker, assistant superintendent of schools in charge of vocational education at Rochester, N. Y., has retired, after completing

Charles King, of the Foch School, Detroit, was elected chairman of the section for one year.

¶ Mr. Earl Bedell, assistant director of vocational education in Detroit, Mich., was the guest of industrial-education men in Flint, on November 4, when he addressed a group of industrial-education men of the junior and senior high schools, principals, and heads of departments of instruction of that city. He spoke on the topic, "Industrial Arts in Education."

¶ Mr. Harold Westrienen, director of vocational education in Hamtramck, Mich., has been appointed a third member of the program committee for the vocational division of the Michigan Education Association. The other members of the committee are Mr. B. S. Frost and Miss Jarrard.

¶ Mr. Joe Giachino, of Hamtramck, Mich., was recently elected subchairman of the manual-arts and industrial-education section of the Michigan Education Association. He succeeds Mr. T. P. Garrity.

¶ Mr. Verne A. Bird, formerly of the Elmira Reformatory, Elmira, N. Y., has been appointed to succeed Mr. Barker in Rochester.

¶ Harry S. Clark, formerly head of the department of woodworking, has accepted a position as assistant supervisor of job training for T.V.A. at Guntersville Dam, Ala.

¶ Miss Elizabeth Fish, principal of the Miller Vocational High School, Minneapolis, Minn., gave a talk before the vocational section of the Michigan Education Association, in the Hotel Statler, speaking on the subject, "The Responsibility of the High School in Preparing for Immediate Employment After Graduation." Miss Jarrard, of the Girls' Vocational School, Detroit, presided at the meeting.

New Publications

Dictionary of Technical Terms

By F. S. Crispin. Cloth, 267 pages, 7⅞ by 5¾, illustrated. Price, $2. Published by The Bruce Publishing Co., Milwaukee, Wis.

The second edition of this dictionary which has become a favorite with draftsmen and craftsmen in all kinds of industrial trades, has been much enlarged, both in content and in number of subjects covered. This dictionary will be found exceedingly handy and will make a valuable addition to the school-shop library.

Consumer Buying in the Educational Program for Homemaking

By Beulah I. Coon. Paper, 202 pages. Price, 20 cents. Bulletin No. 182, Home Economics Series No. 19, 1935, U. S. Office of Education, Washington, D. C.

This bulletin, which has been prepared with the needs of home-economics teachers in secondary schools and in the field of adult education in mind, aims to meet the demands for a kind of public-school education known as consumer education. The findings in the study offer practical suggestions in criticizing materials presented and have important implications for teachers in colleges and especially for teacher trainers in the field.

The study takes up consumer buying and its relation to other aspects of homemaking, suggestions for consumer buying at the secondary-school level, and suggestions for adults. The study aims to guide adult consumer-buyers in determining: (1) How to make buying plans which will help them to attain goals set up for themselves as individuals, or for the family, or for the community group of which they are a part; (2) how to analyze the qualities of goods and services in relation to the satisfactions which they give; (3) how to find and appraise guides which may aid them in buying; (4) how to evaluate buying and selling practices which affect the qualities and kinds of goods and services available; and (5) how to co-operate in the solution of present-day problems in consumer buying by fostering better understandings between buyers and sellers, and demanding governmental protection for the consumer as well as for the producer.

Association News

MASSACHUSETTS INDUSTRIAL-EDUCATION SOCIETY MEETS

The Massachusetts Industrial-Education Society held its regular meeting on October 17, in the Hotel Lenox, Boston, Mass.

Following the dinner, Mr. Glasheen, assistant director of the N. Y. A. of Massachusetts, gave a talk on "Administration of the Youth Program in Massachusetts." He maintained that the N. Y. A. movement is primarily vocational education. Vocational counseling plays an important part in the state's program and placement in permanent positions has proved successful.

Mr. Frank Leavitt, honorary member of the society, lauded the work of the N. Y. A. movement, and predicted that the government would make this work permanent.

President Louis A. Van Ham announced that the annual meeting of the New England Industrial-Arts Teachers' Association would be held in Providence, on November 5 and 7. — *A. Irving Dodge.*

NEW ENGLAND INDUSTRIAL-ARTS TEACHERS MEET

The New England Industrial-Arts Teachers' Association held its annual meeting November 6 and 7, in Providence, R. I., with President Walter F. McAndrews in charge.

The legislative committee suggested that the Association get in touch with the United States Commissioner of Education regarding Bill No. 673, to determine whether industrial arts is included in the bill. It was suggested that some portion of the $12,000,000 appropriation might be applied to industrial arts.

It is planned to undertake the formation of a National Industrial-Arts Association in Detroit, in connection with the meeting of the National Education Association, to be held in Detroit, June 27 to July 1, 1937. — *Walter F. McAndrews.*

IOWA INDUSTRIAL-ARTS TEACHERS MEET IN DES MOINES

The Iowa Association of Industrial-Arts Teachers was held on November 5 and 6, in Des Moines. The opening meeting was in the form of a fellowship dinner at which R. M. Hammes, Council Bluffs, presided and H. W. Carmichael, Des Moines, was secretary.

A new feature this year was the formation of a "25-year club" to honor men who have been engaged in the work for 25 years or more. The purpose of this club is to supply some feature of the program for the annual convention.

Among the special features was an industrial-arts exhibit. At the meeting which followed, Professor William L. Hunter of Iowa State College, spoke on "Slides and Films of Industrial-Arts Interests"; E. G. Livingston, also of Iowa State College, spoke on "Some New Uses of Keene's Cement," and A. P. Twogood, Newton, spoke on "Visual Aids for Industrial Arts." A round-table discussion of problems on industrial-arts education followed. A special program of entertainment was carried out, under the direction of Mr. C. J. Schollenberger.

Following the program, there was a business meeting and election of officers.

MICHIGAN INDUSTRIAL-EDUCATION SOCIETY MEETS IN GRAND RAPIDS

The next meeting of the Michigan Industrial-Education Society will be held April 22 to 24, in Grand Rapids, Mich. An interesting and instructive program has been planned. Information concerning the meeting and the speakers can be obtained from Mr. Arthur L. Reagh, secretary, 143 Bostwick Ave., N. E., Grand Rapids, Mich.

CONNECTICUT INDUSTRIAL-ARTS ASSOCIATION MEETING

The Connecticut Industrial-Arts Association, which held its annual meeting in Hartford, on October 30, had an attendance of more than 100 members. The meeting opened with a dinner at the Hotel Bond, with Mr. Harold Gottsegen acting as toastmaster. Mr. Fred D. Wish, Jr., superintendent of schools in Hartford, welcomed the visiting schoolmen. Mr. Raymond W. Phipps, director of industrial-arts education in the State Teachers' College, New Britain, spoke a few words of greeting.

The main address of the meeting was given by Dr. F. Theodore Struck, director of industrial education at the Pennsylvania State College, who talked on the subject, "Creative Industrial Arts." Dr. Struck declared that the country is facing new social and economic frontiers today, and must challenge the problems of the day. Industrial arts, he said, offers unusual opportunities to realize these objectives. Industrial arts offers exploratory training and an appreciative outlook.

At the business meeting, President McAndrews allowed some time to the three commercial exhibitors present. Mr. Rose of the Metal Crafts, Mr. Gross of the Stanley Company, and Mr. Weiler, of the Wrot Iron Designers.

Mr. Arthur Feuerstein displayed medals purchased by the association. These medals are given to boys doing exceptional work in the industrial-arts courses. They may be purchased at a cost of 55 cents each. It is planned to use the original fund as a separate fund to purchase future medals.

A report was given on the Home Craft Club, conducted by Chairman Andersen.

Chairman Sokol, in making his report, exhibited a sample of a state seal for the association. A motion was made to accept the seal and authority was given to purchase two at a cost of $10.

A motion was passed to make all guests honorary members of the Association.

A motion was made to have the president appoint a committee for the state conference. Mr. Ginns, of New Britain, was appointed chairman of the conference committee.

A motion was passed giving the president authority to appoint a committee to investigate and make a report on a bill reported by Mr. Backus. The bill deals with the possibility of getting federal money for industrial-arts subjects.

It was voted to hold the next meeting in the New Britain Teachers' College. — *Harry A. Barnicle.*

FIRST NATIONAL CONVENTION OF FUTURE CRAFTSMEN OF AMERICA

One hundred and fifty enthusiastic boys from all parts of the country met at the Detroit-Leland Hotel, Detroit, Mich., on November 6 and 7, for the first national convention of the Future Craftsmen of America.

Robert Stimac, a student of the Cass Technical High School, Detroit, was elected convention chairman and president of the national organization. He presided at the business meetings which culminated in a national organization of the youth movement. Acting as advisers at the meeting were Dr. Paul L. Cressman, Harrisburg, Pa.;

(Continued on page 8A)

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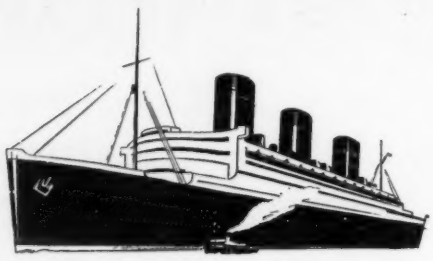

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Blueprint Reading

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116 pages, 56 drawings, $1.80

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As a preliminary to mechanical drawing, the course is effective in giving the student an understanding of the principles of working drawings, thereby facilitating his progress in drafting. He also acquires a considerable knowledge of the materials and processes used in building and mechanical work and gains the point of view of the mechanic who obtains information from the working drawings produced by the draftsman. Teachers' Key available.

Write for further information

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(Continued from page 34)

Mr. Earl L. Bedell, Detroit; and Dr. Irvin S. Noall, of Salt Lake City, Utah.

Among those taking part in the sessions were Supt. Frank Cody, of Detroit; Asst. Supt. W. E. Bow, of Detroit; John H. Trybom, director of vocational education in Detroit; Mr. J. Lee Barrett, Detroit; F. E. Searle, superintendent of the Henry Ford Trade School, and others.

The business included the adoption of a constitution, reports of committees, presentation of degrees, and adoption of resolutions and bylaws.

The officers elected were:

President, Robert Stimac, Detroit, Mich.; vice-presidents, Aldo Fontanini, Salem, Oreg., Beverly Francke, Ponca City, Okla., Chester Olroyd, Joliet, Ill., Max Green, Pravorten, Pa.; secretary, Phillip Eisenberg, Detroit; treasurer, George Fern, Lansing, Mich. — *W. R. Nylund.*

TEXAS VOCATIONAL TEACHERS MEET IN FORT WORTH

Teachers of practical arts and vocational education held a meeting in Fort Worth, on November 26, in connection with the annual convention of the state teachers' association. The guest speaker was Mr. George P. Hambrecht, president of the American Vocational Association, who spoke at the third general session.

A number of sectional meetings were held on Friday, November 27, including the groups in home economics, industrial arts, trades and industries, industrial education, and the Texas Vocational Association. Among the speakers at the industrial-education section were W. R. Cate, Jr., J. G. Grove, N. S. Hunsdon, George H. Fern, and Dr. George P. Hambrecht. Dr. E. A. Elliott spoke before the trade and industrial section. Speakers at the industrial-arts section were Mr. John F. Stanley, Mr. Albert T. Krueger, and Dr. Arthur B. Mays. The guidance section, which was in charge of Mr. Merrill Bishop, had as speakers Mrs. Grace C. Keeling, Mr. E. E. Dyess, Mr. James T. Shea, Dr. C. C. Mason, and Dr. H. E. Chamberlain. Included in the junior-high-school section was a discussion of "The Place of Industrial Arts," by Mr. Harry Gerbens, of Port Arthur. The discussions were handled by Miss Bernice Mallory and Prof. Victor J. Smith. — *V. J. Smith.*

INDUSTRIAL-ARTS DINNER MEETING

Beta Chapter, Epsilon Pi Tau of Ball State Teachers College, sponsored an industrial-arts dinner meeting in connection with the Indiana State Teachers Association meeting in Indianapolis, on Thursday, November 22.

Dean Clyde A. Bowman of The Stout Institute, Menomonie, Wis., Mr. Russell A. Greenlee of Purdue University, Lafayette, Ind., and Dr. William E. Warner of Ohio State University, Columbus, Ohio, were the speakers on this occasion.

PRINTING EDUCATION WEEK

The ninth annual Printing Education Week, sponsored by the National Graphic Arts Education Guild, will be held from January 15 to 22. The dates set include the 231st anniversary of the birth of Benjamin Franklin on January 17, and the program will be concerned largely with honoring the memory of Franklin.

It is expected that the 1937 observance will be better organized and more widespread than ever. This is due to the organization of the National Graphic Arts Education Guild last year, which has for its chief objectives "to promote Printing Education Week and to afford active participation of student graphic arts clubs."

The observance will be in charge of Chester A. Lyle, printing instructor in the McKinley High School, Canton, Ohio. He will be assisted by a selected group of the leading teachers of the United States and Canada, as well as by the newly elected officers of the National Guild.

Among the special features of the observance will be an open house, attractive displays of printing, various talks by educators, window-card displays, exhibits of courses offered, displays of books on Franklin, and the promotion of programs by local clubs or chapters of the National Graphic Arts Societies.

School-Shop Equipment News

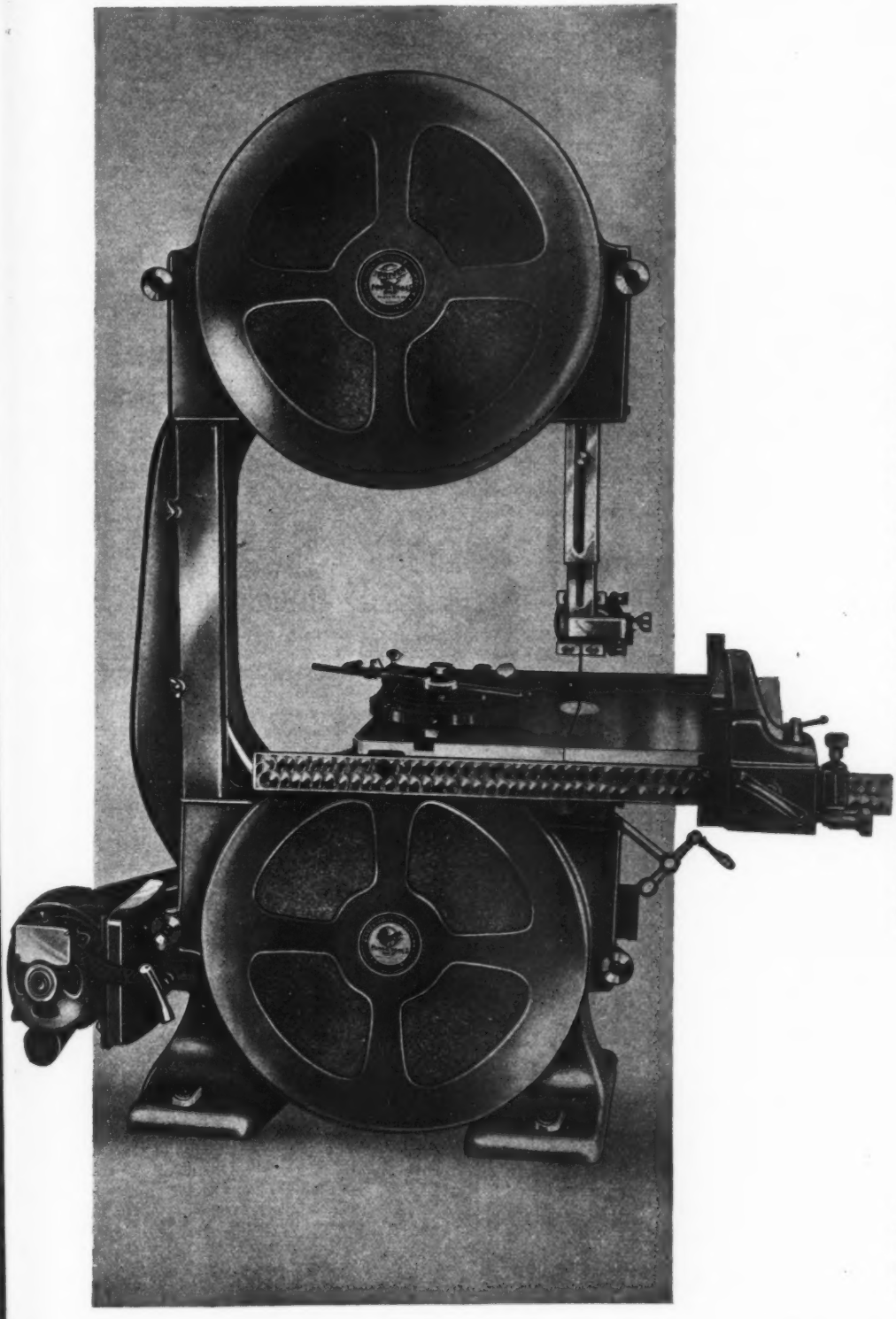
NEW METAL-CUTTING MITER BOX

The Stanley Rule and Level Plant, New Britain, Conn., has announced a new sturdy, easy-to-use miter box, which is intended for cutting metal trim, metal moldings, and similar work.

The No. 2358-MC miter box has a depth capacity of 4½ in., a width capacity at right angles of 9½ in., and at 45 deg. of 4½ in. It is equipped with a special saw frame and a high-quality hack-saw blade, 24 by 1 in., with 24 teeth to the inch. It also is equipped with swivels, uprights, legs, and saw guides, all made of malleable iron. Automatic saw-guide catches hold the saw above the work, leaving both hands free to place the work in position.

(Continued on page 10A)

Again WALKER-TURNER ENGINEERING



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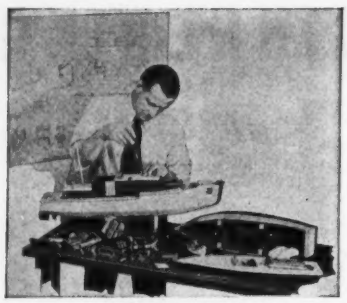
Walker-Turner Engineered Power Tools include Bench Saws, Band Saws, Jig Saws, Jointers, Drill Presses, Lathes, Flexible Shafts, Motor Grinders.

WALKER-TURNER *Engineered* POWER TOOLS



The most complete Stock of Model Boat Parts Available to Shop Instructors and Schools.

MODEL
BOAT PARTS

Fine, die-cast Reproductions of EVERY PART NEEDED in the Construction of Model Boats, from Dinghys to De-Luxe Cabin Cruisers, properly scaled to size.

POWERFUL INBOARD and OUTBOARD MOTORS.

16 R. Blue Steel Spring.

Send 10c for Plans to Build Six MODEL POWER BOATS with Illustrated Catalog and Price List.

Note the Design, Finish and Detail of the Few Parts Illustrated.

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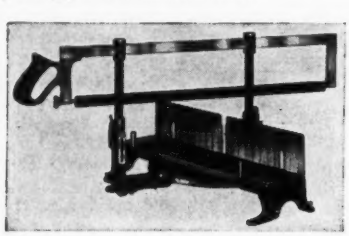
MILWAUKEE WISCONSIN

(Continued from page 8A)

The miter box is attractively finished in light blue, orange, and aluminum color.



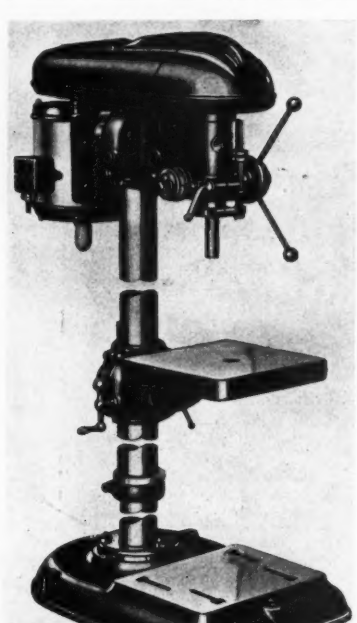
Complete information will be furnished to any shop instructor upon request.

NEW DELTA LINE OF DRILL PRESSES

The Delta Manufacturing Company, 600 East Vienna Ave., Milwaukee, Wis., has announced a new line of drill presses, which are intended to meet the needs of the general shop and to be adaptable to a wide range of jobs.

These new drill presses are 66 in. high, 18 in. wide, and 27 in. from front to rear. The floor base has a 10 by 13¾-in. table. The floor-type model is provided either with an 11 by 12-in. tilting table or a 12½ by 17-in. production table.

An extra-large spindle pulley provides five speeds: 385, 600, 935, 1450, and 2240 r.p.m., and is carried in two self-sealed new-departure ball bearings. The pulley is of the floating type, in which none of the belt pull or stress is transmitted to the spindle. The spindle, of advanced design, does not project through the pulley but is keyed to it, and the lower end is machined to form a 10-tooth automobile-type spline, which slides in a sturdy floating sleeve. The sleeve has a long bearing on the spindle, permitting sensitive feeding and practically eliminating wear. Sleeve and quill slide on the spindle. The spindle is carried at the lower end of the quill in two self-sealed new-departure ball bearings, preloaded and closely spaced, thus eliminating spindle whip and wear.



Tables for the floor-type machine are fitted with a gear and rack-raising and lowering mechanism, with the end of the rack carried on a ball-thrust bearing. A built-in foot feed is also available. Advantages claimed for the machine are that the heads can be used as units to build up special drilling fixtures. Their use makes for low-cost economy. It also is possible to use a number of heads together by linking the foot feeds to a common lever.

ANNOUNCE NEW WORKSHOP PRECISION LATHE

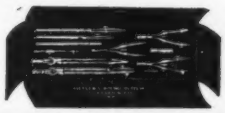
The South Bend Lathe Works, South Bend, Ind., has just issued a 24-page catalog, describing their new 1937 model 9-in. workshop precision lathe.

The catalog illustrates more than seven styles. These embrace: (1) the adjustable belt-tension horizontal motor drive, (2) the countershaft drive, (3) the underneath-belt motor drive, (4) the pedestal motor drive, (5) the toolroom lathe, (6) the 9–11-in. swing workshop lathe, and (7) the plain-type horizontal motor drive.

A number of pages are devoted to various features of the 1937 model workshop lathe, with illustrations showing methods for obtaining and testing the degree of accuracy for which these lathes are noted. A total of 64 tests has been made to insure accuracy in the alignment of all parts.

The new lathe shows a number of improvements on the back-geared headstock, including the new twin-gear reverse for right- and left-hand feeds, large spindle bearings adjustable for wear, ball thrust on the headstock spindle, take-up nut for eliminating end play of headstock spindle, and hollow headstock spindle machined from a solid bar of alloy steel. The bed

(Continued on page 13A)



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A Weber-Cosmos Drawing Set is more than mere equipment. It is a set of precision instruments. Instill into your pupils the desire for fine craftsmanship. Recommend and specify Weber-Cosmos Drawing Instruments.

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We supply everything needed for this fascinating work. Largest assortment of materials at lowest prices. Samples FREE to teachers, camp instructors, etc., who write for same on official letterhead or give connections. Others

SEND FOR SAMPLES ENCLOSE 5 CENTS in Stamps

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FOR THE LEATHERCRAFT WORKER

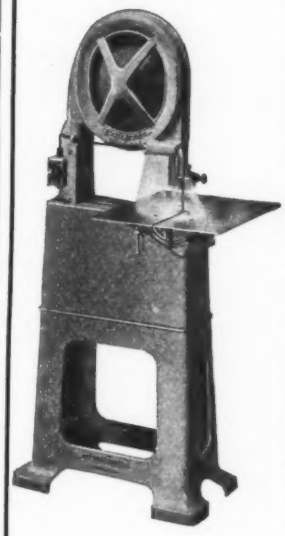
Headquarters for Art Leathers, whole or half skins, also cut to measure. Tools, designs, lacings, both in calf and goat skin, snap fasteners to match leathers, leather dye, wax polish, Sphinx Paste, slide fasteners and bag plates. Book on leather work $1.00

Tell us your wants—we'll quote prices.

W. A. HALL & SON
253 Devonshire St., Boston, Mass.

Wallace PORTABLE MACHINERY

No. 16
BAND SAW



Dynamically balanced throughout—with a special gear drive providing optional wheel speeds up to 1100 r.p.m. or 4600 feet of blade per minute,—that is the reason why the Wallace No. 16 Band Saw operates so smoothly, so effortlessly and safely on the heaviest work. This machine is engineered for hi-speed production performance,—every detail of construction has been carefully worked out from the generous lines of the sturdy base to the special precision ball-bearings, hardened and ground wheel shafts, and patented roller-bearing guides above and below the table.

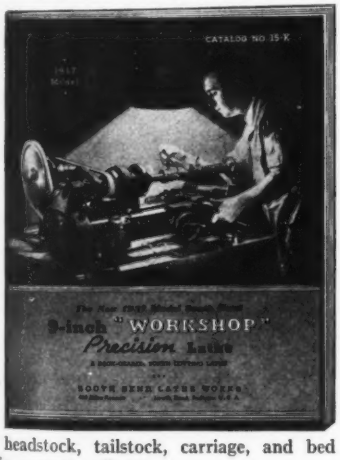
Present school users of the Wallace No. 16 Band Saw will be glad to learn that special chromium-alloy Swedish steel blades are now available in standard sizes. These blades cut truer, stay sharp longer, and reduce blade costs due to breakage.

Write today for information about the No. 16 and the blades we supply,—also about our line of circular saws, jointers, mortisers, lathes, shapers, grinders, drills, and glue pots for the modern school shop.

J. D. WALLACE & COMPANY
140 SO. CALIFORNIA AVE. CHICAGO, ILL.

(Continued from page 10A)

is a one-piece casting of steel and nickel iron; the lathe bed has three V-ways and one flat way, accurately planed, seasoned, and handscraped;



the headstock, tailstock, carriage, and bed are all in accurate alignment.

Complete information may be obtained by writing to the technical service department, South Bend Lathe Works, South Bend, Ind.

NEW CATALOG OF MODEL MOTORS AND PARTS

The Calcraft Corporation, 2732 Colorado Blvd., Los Angeles, Calif., has issued a new catalog, showing its complete line of Orkincraft scale-model miniature motors and parts. The catalog offers plans and accessories showing the very complete range of boat parts and motors carried by the firm. These include propellers, anchors, steering wheels, engine controls, skylights, ventilators, windshields, bow plates, stern plates, deck plates, deck plugs, portholes, and propeller shafts.

Orkincraft parts are perfectly designed and scaled to size and are well adapted for model-boat building projects in school shops.

A copy of the catalog will be sent to any shop instructor who requests it.

News Notes

Occupations on Parade

"Occupations on Parade" was the title of a radio program, sponsored by the Detroit board of education. The program is given regularly over Station WJBK and the talks are listened to by the classes of the city schools.

Culver Teaches Use of Motor Truck

Culver Military Academy, at Culver, Ind., is offering this year a course in motor-transport operation as a means of meeting the latest requirements in the teaching of military tactics. Culver is the first to depart from the traditional courses and to teach its students the nomenclature and mechanical operation of the modern truck of the type commonly used in the United States Army. The course covers the practical study and operation of the trucks as a part of the regular curriculum.

Lecture Series at Polytechnic Institute

The New York Section of the American Welding Society has co-operated with the Brooklyn Polytechnic Institute in the presentation of a series of lectures on "The Fundamentals of Welding." The lectures are given in the Institute, each Tuesday evening, at 6:45 p.m., and have been offered regularly since November 10. The course covers ten illustrated talks on various phases of welding, and the speakers are well-known men in the field.

Industrial-Arts Work for Girls

In the Merrillville High School, Merrillville, Ind., last year, a problem arose of satisfying the desire of the girls for industrial-arts work. To meet the needs of these girls, the instructor, Lawrence Rumbaugh, organized a girls' Industrial-Arts Weaving Club as an extracurricular activity.

No definite requirements for membership have been set up. Each girl is given experience in weaving a simple table mat, and afterward is permitted to select a project of interest to her. Individual attention is given to each weaver with the result that many of the group become quite skilled in this field of the creative arts.

The club meets weekly and is under direct supervision. Like other clubs of extracurricular activities, the group chooses its own officers and enjoys its share of social activity under school regulations.

A "Printers' Progress Special"

Following a first showing for three days at the Grand Central Terminal in New York City, the American Type Founders' "Printers' Progress Special," first under-power industrial exposition to tour the nation by rail, left New York City on September 16 for Pittsburgh, Cincinnati, and points westward.

The general public was not admitted to the train; tickets were issued on application to branch offices of the American Type Founders and companies associated with them in the enterprise.

Conceived by Mr. H. W. Alexander, general sales manager of the American Type Founders, the train was literally a printing plant on wheels that demonstrated the case history of a printing job from the manuscript to the finished article. The exhibit also contained much to interest bookbinders because it showed the latest types of equipment used in bindery operations.

(Continued on page 15A)

NECESSITY

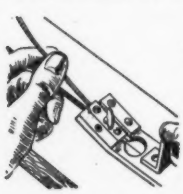
for Wood-Linoleum-Leather

The fact that the U. S. Government allowed this patent proves that it is a NEW idea for doing inlaying quickly. Tedious tasks that formerly took hours with a knife or a chisel can now be done in a few minutes with this K & D hand routing kit.

—INLAY—Not only does this hand router cut the inlay groove, it also does the more difficult part of the inlaying—cuts an IDENTICAL wedge or filler to fit the groove.

So Easy a Child Can Do It

Straight lines, are the easiest to cut with the hand router. The tool lies flat like a plane. Its straight sides are easily guided along a straight-edge. It cuts irregular curves by just following the design. It cuts perfect circles or segments by use of the compass bar.



In making inlays, if desired, the strip that is removed may be stained and replaced.

CRAFTSMEN find the Compass Bar a handy gauge for reeding and fluting spindles with the router.

Mouldings for model houses and model ships are easy to make with the router. The strips removed can be glued alongside of the rout and built up in various ways. A large variety of picture frames may be made in this same way.

TEN-DAY FREE TRIAL

Use this coupon

KRAUT & DOHNAL, INC.,
325 S. Clark St., Dept. I, Chicago, Ill.

I enclose money order for two dollars. Send me a K&D Hand Routing Kit including the router, compass bar, three cutters, screw driver and emery cloth. I will try it ten days and if for any reason I am not satisfied, I will return it to you and you will return my money.

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Everything the ship model builder uses, including tools.

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FINE CABINET WOODS

VENEERS — LUMBER — PANELS — INLAYS — INLAID BORDERS

Proper Woods are the basis of all good work. Why not Use the Best and secure more pleasure and profit from your workshop.

INQUIRIES INVITED

Our Catalog lists over 100 woods, Photographic Instructions in Veneering, and many interesting items. Send today 25c in advance. Cost rebated against first purchase

ALBERT CONSTANTINE AND SON, INC. 795 East 135th Street, New York City

Catalog Sent Without Charge to Supervisors and Shop Instructors

ARMSTRONG

Off-Set Spring Cutting-Off Tools

Makes cutting-off, the most difficult lathe operation, easy. Goose-neck form prevents work from climbing upon tool — the cause of most tool breakage.

Write for Catalog

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"The Tool Holder People"
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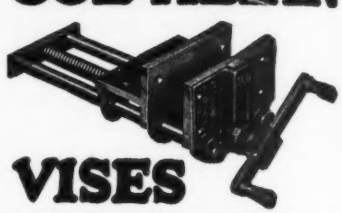
COLUMBIAN



VISES

The complete "Columbian" line includes vises of every style and size for wood and metal work. Also drop forged steel "C" Clamps.

THE COLUMBIAN VISE & MFG. CO.
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is one of the most popular crafts in school work.

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Send for a sample copy of our brochure "The Metal Crafts" and mention this magazine. It is full of helpful suggestions for teachers.

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37 Aborn St., Providence, R. I.

TOOLS ALWAYS SHARP with PLURALITY OILSTONE TOOL GRINDERS

No. 450 Plurality Jr.

Now available in 3 sizes
No. 425 Plurality Sub Jr.
No. 450 Plurality Jr.
No. 475 Plurality

Grinding can be done on a cone, coarse or fine oilstone, leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

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Originators and Pioneer Manufacturers of Oilstone Tool Grinders

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A Manual Training Bench that stands the test of time

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Sound material, interesting presentation, and reasonable price combine to make this the outstanding mechanical-drawing value on the market today.

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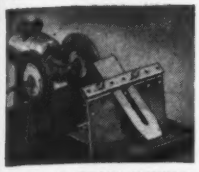
WHY PAY $200 OR MORE?



NEW $15 CHARTIER TOOL HOLDER FITS ANY GRINDER- USED FOR CORRECTLY SHARPENING PRACTICALLY ALL SMALL TOOLS—STUDENTS CAN USE IT!

THE CHARTIER TOOL HOLDER makes it possible to accurately sharpen twist drill bits, metal lathe cutters, chisels, gouges, plane irons, almost all small tools. Many grinding equipments costing $200 and $400 do not equal the flexibility of this remarkable device. Chartier fits ANY GRINDER. COSTS ONLY $15 COMPLETE.

Students learn to use the Chartier quickly. They sharpen small tools accurately at most angles, arcs or their combinations *without "burning"*. The Chartier teaches *correct sharpening methods.*

Don't waste YOUR time sharpening students' tools nor pay to have it done outside. Chartier pays for itself in time, tools and resharpening costs saved.

SPECIAL TRIAL OFFER! Send for a Chartier Tool Holder today **ENTIRELY AT OUR RISK.** Enclose check or money order for $15.00. Use the Chartier for 10 days in your shop. Let students use it too. If not more than convinced—return equipment and money will be refunded immediately. Further details gladly furnished if desired.

CHARTIER TOOL HOLDER 7312 Bennett Ave., Dept. 58 Chicago, Ill.

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BLACK DIAMOND
McCAFFREY

THESE FILES

Test the ability of Nicholson, Black Diamond and McCaffrey Files to do better, faster and more economical work for you and your students. You'll find these files the best value your school's money can buy. At your supply dealer's. Nicholson File Company, Providence, R. I., U. S. A.

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A FILE FOR EVERY PURPOSE

NEW CATALOG

"HARD-to-GET" MATERIALS

Cabinet hardware, glue, finishing materials, upholstering fabrics, transfers, electric clock movements, bridge arms, tea wagon wheels and hundreds of other items all at wholesale prices.

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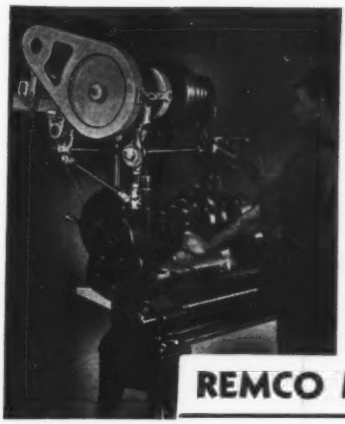


MOTORIZE

—reduce noise

Make the room above the school shop tenantable by ousting noisy overhead line shafting. Motorize! Quietize! Eliminate dangerous overhead belting. Your present machine tools motorized, the Remco-way, at surprisingly low cost. Investigate! Planning costs nothing.

Manley Products Corporation, State & Hay Sts. York, Penna.

REMCO MOTOR DRIVE

(Continued from page 13A)

In November, the route was Portland, Sacramento, Oakland, and San Francisco.

Toy Exhibit at Detroit, Michigan

An exhibit of 1,550 toys made by boys in the industrial-arts classes of the Edgar Guest School in Detroit, was held on December 10, in conjunction with a parent-teacher association meeting. The toys were a part of the annual Red Cross toy-building program, participated in by the industrial-arts classes of the school system. These toys are constructed and distributed to patients and underprivileged children in institutions suggested by the local Red Cross chapter.

Cass Craftsmen Get New Tools

The machine shop of the mechanical department of the Cass Technical High School, Detroit, Mich., is being gradually equipped with new machines. So far this year, a new surface grinder, drill press, and power hack saw have been received. Later in the term it is planned to install other machines. The total value of the equipment is estimated at $11,000.

Hobby Exhibit at Cass School

During the week of the National Convention of the Future Craftsmen of America, in Detroit, Mich., the Cass Tech chapter sponsored an exhibit of various kinds of craftsmanship in two showcases in the lobby of the Cass Technical High School. The display comprised model airplanes, gas and steam engines, and model yachts, and each was the product of each maker's own design.

Cass Student Builds Miniature Automobile

A miniature automobile has been built by a student in the Cass Technical High School, Detroit, Mich. The car, which was built from junk-yard parts, motorcycle parts, and airplane parts, is capable of attaining a speed of eighty miles an hour and consumes a gallon of gasoline for each sixty miles.

Stout Offers Trophy to Future Craftsmen

Mr. William B. Stout, president of the Stout Engineering Laboratories, has offered a trophy, to be awarded annually in national competition, to the boy producing the most ingenious and useful device. The trophy is to be known as the Stout trophy and will be awarded annually by the Michigan body of the Future Craftsmen of America.

New Courses in Cass Technical High School

The Cass Technical High School, in Detroit, is offering some of the more advanced courses, comprising radio, refrigeration, and air conditioning, the latter two being offered in the evening school. It is planned to introduce television in the near future.

Answers to Questions

MATCHING NEW AND OLD MAPLE

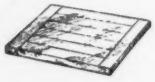
1021. Q.: I am reworking an antique "fiddleback" maple drop-leaf table. Since several pieces of new wood have been used in restoring the piece, I have encountered difficulty in staining the white new wood to match the old material which is light brown in color. Also, the table is not to be finished in a dark shade of brown, but must be the amber of honey maple. Please advise a finishing procedure and tell me where I can obtain the stain required, in small quantities.—*B. T. T.*

A.: Sand all parts to clean bright wood. Dust off and bleach with any of the commercial chlorine solutions sold under the name of "Hyzo 2," "Chlorox," etc. Dry overnight. Sand with 4/0 paper. The color you desire can probably be made by using a 1-oz. solution of potassium dichromate in a gallon of warm water, carrying a trace of standard-walnut, 4-oz. solution water stain to tone up the golden to a slight over-tint of brown. This should be arrived at experimentally on a sample and given a weak coat of half orange and white shellac before judging the color. Your specifications then should read:

1. Sand clean to bright wood on all parts.
2. Stain with water stain. Dry 12 hours.
3. Sand with old 6/0 paper and felt, just enough to produce a fine, even color surface.
4. Seal with orange and white shellac 4-lb. stock, equal parts, reduced with five parts of alcohol; then poured into an equal volume of shellac-mixing lacquer. Apply with brush or spray gun. Dry hard and sand with split 6/0 paper.
5. Dust off and varnish with a high-grade 4-hour varnish. Dry 24 hours in a warm room.
6. Sand with a split 6/0 paper. Dust off and revarnish. Dry one week, at 75 deg. F.
7. Rub for finish with FFF pumice stone, hard felt, and crude oil. After rubbing, leave on the rubbing sludge of oil and pumice, take a handful of clean cotton waste; dip in water, squeeze lightly to remove excess water and use as a pad to produce that rich, rubbed effect of smooth depth so much desired. Clean up with fine, soft cloths like old worn-out shirt-back panels. Polish or not, as desired. Finishes on maple should be fine, hard, thin, and apparently a part of the wood itself. Avoid thick, varnished coatings.—*Ralph G. Waring.*

THE MARKET PLACE

United States Blue Print Paper Co.
A complete line of Drafting Materials for Schools and Colleges
Let us quote your requirements
United States Blue Print Paper Co.
207 South Wabash Ave. Chicago, Illinois



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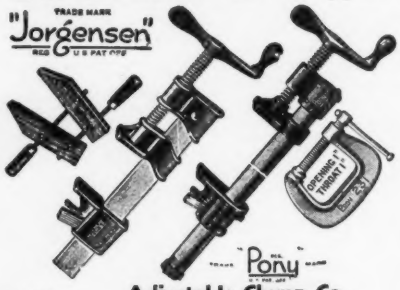
FORGES - MELTERS - OVENS
AMERICAN GAS FURNACE CO. PIONEERS IN IDEAS LEADERS IN SERVICE
Complete Tables
BLOW PIPES
Suitable sizes for school shops
Write for complete information
American Gas Furnace Co.
ELIZABETH, N. J.

CLAMPS *Over 40 Types*
TRADE MARK "Jorgensen" REG. U.S. PAT. OFF.


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"The Clamp Folks"
424 N. Ashland Ave., CHICAGO, U.S.A.

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for Instructors and Students

Write for our new Fall 1936 Catalog showing complete line of MASTERMADE Frocks, Coats and Aprons, with samples of materials.
Correct styles, highest quality fabrics and materials . . . . and PRICED RIGHT.
DON'T PUT IT OFF . . . WRITE TODAY!
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Est. 1901

1896 ORIGINAL 1936
Toles Vises
18 Models for Woodwork only
2 Actions — 3 Sizes
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CABINET HARDWARE — TOOLS AND SUPPLIES
Our large stock of hardware supplies and nationally known hand tools offered to school shop supervisors and instructors at wholesale prices.
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Operating our own kilns assures you of dryness. Deal with a house known a half century for Quality and Service.
DOMESTIC HARDWOODS
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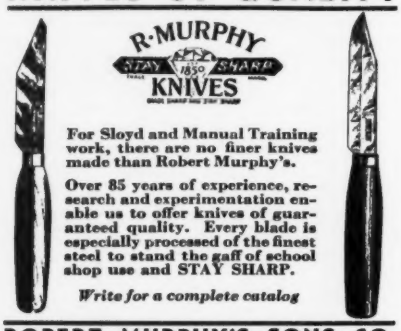
KNIVES OF QUALITY


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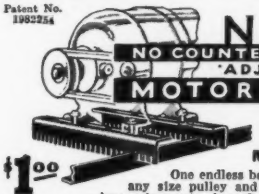
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